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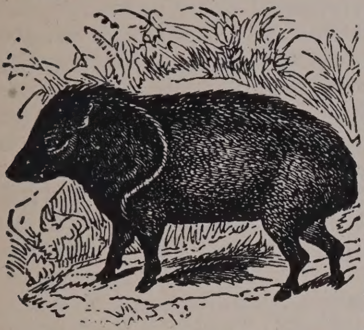
Peb′ble, a small, round, water-worn stone of any kind, but with jewelers sometimes agates — agates being frequently found as loose pebbles in streams, those of Scotland being designated as Scotch pebbles. Deposits of pebbles occur among the rocks of all periods; but the older pebbles are seldom loose; they are generally cemented together by iron oxide, lime or silica.

Pecan. See Hickory.

Pec′cary, a small pig-like animal inhabiting the forests of the New World. There are two species. The more northern or collared peccary occurs as far north as Red River in Arkansas, and ranges south to Rio Negro in Patagonia. This species is about three feet long; it occurs singly or in small herds of eight or ten, and is comparatively harmless. The white-lipped peccary is about forty inches long, and, like the collared peccary, is covered with thick, bristly hair. Its range is between Paraguay and British Honduras. They occur in herds of fifty to one hundred or more, and are dangerous when excited. Both kinds live on roots, fruits, worms and the like. In cultivated districts they are destructive to crops.



COLLARED PECCARY

Peck, Harry Thurs′ton, a critic, author and language scholar, was born in 1856 at Stamford, Conn. In 1881 he graduated from Columbia University, where in 1888 he became professor of Latin and, after several years, instructor in Sanskrit and Latin. Professor Peck was an editor of *Harper's Classical Dictionary, The International Encyclopædia* and the *New International Encyclopoedia.* He was editor of *The Bookman*, and the author of many reviews and of *The Semitic Theory of Creation; Suetonius; A Manual of Latin Pronunciations; The Personal Equation;* a volume of verse entitled *Graystone and Porphyry; What is Good English?* He died in 1914.

Pedagogics (*pĕd-ȧ-gŏj′ĭks*). The term pedagogics as now used embraces the whole field of education, though formerly it was restricted to the formal phases of the subject, as school organization, methodology and the philosophy of education.

There are certain subconscious forces always at work in the education of the youth as well as of the adult, which in a general way may be denominated his environments. These are the environments of the age as well as of the community The movements and sentiments of the world at large often affect the youth in a profound manner. This is more true in these days of rapid transit and intercontinental telegraphic communication than formerly. Great economic, political, international and social movements in any part of the globe quickly attract the attention of the reading youth, provoking more or less sympathetic discussion, with consequent enlightenment and enlargement of conceptions of the problems involved. Thus the world-spirit of an age exercises influence in the education of the youth, particularly among civilized nations.

In like manner the institutions of one's own country and community, including every private and public interest which touches their lives, are active factors in the intellectual and moral development of the people. The community-spirit, though influenced largely by the world-spirit has a distinct and positive character of its own that in certain directions is often more potent than the formal educational machinery of the schoolroom. It affects the ideals, language, occupations, tastes, manners and customs of every one in such a way that he easily reveals his locality wherever he goes. The various institutions of civilization — church, home, press, scientific and professional associations, political and fraternal organizations, commercial and industrial unions each of them making a more or less formal attempt at education in certain lines — conspire to educate the masses of the people of all classes and of all ages. The fact that these different forces often are antagonistic to each other does not in any way lessen their efficiency as educational factors.

It will readily be conceded that, however universal and effective these influences may be, at best they accomplish little in systematic development of the activities of the child. They serve rather to contribute a continuous stream of varied information, to stimulate interest, to shape sentiment and to influence conduct.

The systematic development of the activities of the child, which is the true end of formal education, can be accomplished only by the directing influence of an individual will; a will which sets up an ideal which the child is to realize and then proceeds in a methodical way to help it realize that ideal. Herein is found the specific function of the teacher. For this purpose the school is organized, equipped and maintained It anticipates the larger life of the community and of the adult by so developing his activities as to fit him for the wider sphere of action to which he is destined. It strives to give that freedom in thought and action which will make him independent, self-reliant and successful in the affairs of life.

All the activities of the child emanate from the will. The will performs a double function. It sets up ideals and then sets about to realize them. In childhood the imitative impulse is strong, and the child finds great satisfaction in taking its ideals from the concrete examples about it, imitating them with great facility. Thus it learns to walk, to talk, to do a thousand things. The ideational impulses are also active and with the enlargement of its experience, under proper guidance, gradually displace the purely imitative impulses and enable the child to think and act more or less independently of the suggestions of his surroundings. Whereas his environments were molding him before, he now begins to mold his environments. This mutual reaction of the individual will and the community's will, resulting in the individual will becoming the dominating power, cancels the further need for assistance from the teacher and the school.

It is the function of the teacher to encourage in every possible way the imitative or realizing activities of the child, but t is even more important that he with great wisdom continually stimulate the exercise of the idealizing activities — perception, memory, imagination, judgment, thinking, reasoning. To this end a knowledge of the genesis, nature and laws of development of the intellectual activities of the child is essential as a basis for successful teaching. The intimate relationship between the mental and the bodily activities also requires a similar knowledge of physiology and hygiene. As the emotional and volitional life of the child gives vitality to both, the preparation of the teacher includes not only a comprehensive study of the child's physical and mental organism but of the child in action as well; of the child at home, at his plays, at work, alone, with his fellows, in his moods, in his studies; of the normal and the abnormal child, of the child's motives, of the child in the different stages of his development and in the processes of transition from one stage to another.

With such an acquaintance with child-nature, the teacher is able to enter upon a study of the underlying principles of education and of the methods by which it is to be accomplished. The following-named elementary books will prove of great value in studying the genesis, nature, function and laws of the mental life of the child: *The Study of the Child*, Taylor; *The Mental Development of the Child*, Preyer; *Psychology and Psychic Culture*, Halleck; *Inductive Psychology*, Kirkpatrick; *Primer of Psychology*, Ladd; *The Study of Children*, Warner; *Thinking, Feeling, Doing*, Scripture; *Psychology in the Schoolroom*, Dexter and Garlic; and *The Story of a Child*, Loti. See, also, *The Psychologic Foundations of Education*, Harris.

The nature of education appears only as one clearly understands the nature of the act of learning. The nature of the act of learning is apprehended only as one clearly sees the nature and function of the self-activity of the child. That self-activity, generically speaking, is its will. It manifests itself in feelings, cognitions and external actions, embracing the whole range of the child's conscious life. It is incited to action by sense stimuli from within or from without the body and responds by making attempts to locate them in space and discover their characteristics and relations. This effort, if successful, is called the act of learning. By it the child simply relates a present sensation or experience to a past experience, that is, connects them in the mind by virtue of their common elements and puts the new experience where it belongs. This process of transforming the new and strange into the familiar by associating, comparing and identifying it with things already familiar, is the form which every act of learning takes and is called the apperceptive process. In this way we get the meaning of things. For an elaboration of the nature and function of the apperceptive process see *Lange's Apperception*, De Garmo; *A Pot of Green Feathers*, Rooper; *The Study of the Child*, Taylor; *Herbartian Psychology Applied to Education*, Adams; *Talks to Teachers*, James; *Psychology*, Dewey; and almost any late work on mental science.

The act of learning in getting original knowledge may be accomplished (*a*) by the observation of things, particularly of things in action; (*b*) by experimentation; and (*c*) by means of the reasoning process. The first two may result in direct perception forming simple, or by apperception, complex mental pictures of objects. They also furnish the percepts, the images, the materials out of which the reasoning processes may elaborate general notions and principles (*induction*) or to which they may apply notions and principles already formed (*deduction*). Every notion is built up of elements derived through observation, experimentation and reasoning. Hence the importance of cultivating habits of accuracy and many-sidedness in sense-perception.

The reasoning process is the highest form of knowledge-getting, and, properly exercised, continually reacts upon the other two, increasing their range and power. As a result, the growing child, at each step in his progress, is able to interpret many new experiences immediately, by simple apperception, which in a previous stage would have required even laborious reasoning.

The preparation for teaching has made great progress when the prospective teacher fully understands the details of the processes involved in the act of learning, for teaching is simply the art of stimulating and guiding the self-activity of the child to economical and speedy accomplishment of that act. Here again appears the necessity for an intimate acquaintance with the nature and functions of the child's mental activities.

How may the teacher assist the child in the effort to learn?

As a prerequisite, it is necessary for the teacher to discover the degree of the child's familiarity with the elements of the subject under consideration. If he has little or no acquaintance with it, the object should be presented, and a variety of methods used to encourage him in the formation of a picture of it and of its relations to other objects, its uses etc. If an object is not available, the next means in order of desirability would be a model, a colored picture, a photograph, a drawing and, lastly, a verbal description. Even though the object be at hand, the others will be found valuable, in the order given, to lead the child gradually away from the necessity of the object itself, to be able to produce a mental picture of it from its merest outline in chalk or pencil or from a verbal description only. By means of the multitude of objects round about him the teacher may stimulate the child's powers of observation to an almost unlimited degree.

If the child already has some acquaintance with the subject under consideration or with its types, the teacher may help him to recognize that fact by assisting him to identify the common elements, thus enabling him the more easily and quickly to understand the new elements and form a familiar mental picture of the whole.

Should the child be familiar with some of the elements under consideration and have sufficient ability to follow reasoning processes, the teacher may aid him by leading him carefully from one point to another until he gets its full meaning. In this way he may be taught how to trace the relations of part to the whole, of cause to effect, of identity and difference.

These three attitudes or stages in which the child's mind may be with reference to any subject are called sense-perception, imagination and the logical or thinking stage. As sense-perception is predominant in the early years of the child's life, that term is then applied in a general way to his method of getting knowledge, though the other two methods are rapidly coming into prominence. From six to 12 his picture-forming activities — conception, memory and imagination — make a large part of his mental life. At about 12 the power to reason abstractly is usually recognized as a strong factor in knowledge-getting, particularly if the child has been properly educated. The interdependence and interaction of these lower and higher activities in the act of learning demand quick discernment and wise adjustment on the part of the teacher to the pupil's needs. It is a great mistake to encourage the child to depend upon his lower activities in an act of learning, when he might be using the higher ones.

While it is important that the child be trained to observe, investigate and form his own ideas about the objects with which he comes in contact every day, his ability is greatly increased as he learns how to use books as aids in his efforts at knowledge-getting. It is important that books be introduced in such a way that the pupil will be constantly multiplying and enlarging his capacity to interpret his increasing range of experiences and the problems which they involve. The act of learning as such, however important, should always be regarded by the teacher as but the process by which the self-activity of the child is developing. Each act in perception in forming ideals or in realizing them reacts upon the self-activity, increasing its power and range proportionately at every step. The law of the reaction is this:

However objectively engaged the mind may be, the reaction upon the self-activity in exercise is the same as if it were acting directly upon itself, if that were possible.

These reactions in the act of learning, whether in forming or realizing ideals, result in habits which always are the test of mental capacity and executive skill. It is through the formation of them that all growth is attained, that power to solve the higher and the more complex problems of life is developed.

The importance of right methods of study and of right methods of instruction becomes more and more evident as this reactive effect of every act of the child is understood. For the purpose of educating the teacher properly for the responsible work of teaching four general lines of procedure have been recognized. These consist of the philosophy of education; methodology; school organization and management; and the history of education.

THE PHILOSOPHY OF EDUCATION. This includes an inquiry into the fundamental principles underlying the process of knowledge-getting, the development of the self-activities and the methods by which the teacher may co-operate with the child. The terms *theory of education*, *principles of education*, *psychology applied to education*, *institutes of education*, *psychologic foundations of education* etc. designate similar inquiries. They all strive to discover the philosophic basis of method in education, and in a general way cover the nature, limits, processes, means, special elements, phases, physical culture, intellectual culture, will-culture, ethical culture, æsthetic culture and a variety of kindred problems. The following treatises are among the most useful now published on general theoretical pedagogy: *The Philosophy of Education*, Rosenkranz; *A Manual of Pedagogics*, Putnam; *Lectures on Teaching*, Compayré; *The Philosophy of Teaching*, Tompkins; *Outlines of Pedagogics*, Rein; *Pedagogics of the Kindergarten*, Froebel; *The Method of Recitation*, McMurry; *Theory and Practice of Teaching*, Page; *Education of the Central*

Nervous System, Halleck; *Education as a Science*, Bain; *Education*, Spencer; *Lectures on Teaching*, Fitch, *Interest in its Relation to Pedagogy*, Ostermann (translation by Shaw), *Contributions to the Science of Education*, Payne, *Education of Man* Froebel. The Transactions of the National Educational Association, *Barnard's American Journal of Education* and many state reports contain mines of information on theoretical and practical pedagogy

METHODOLOGY or the art of applying educational principles in teaching has called forth a great variety of treatises on special and general methods. They usually treat of the formal methods of arousing the child's interest, of presenting the subject-matter in the different stages of the child's development, of conducting the recitation, of cultivating the various physical and mental activities of the child and of the essentials in conditions and means. Methodology usually includes more or less of a discussion of the principles involved in the methods presented. The following books treat the subject in an instructive and practical way: *Method in Education*, Roark; *School Management and Methods*, Baldwin; *School Management*, White; *Methods of Teaching* Swett; *Talks on Teaching*, Parker.

ORGANIZATION. A description of organization and management of schools is found on pages 1691–92, together with progressive views on curricular problems and distribution of time. Kindergarten growth (see pages 1002–03) has brought new problems of organization. The Junior college (page 422) has likewise called forth new systems. But the greater adjustments lately have been with relation to the grades and high school. The peculiarly American plan of the eighth grade system has been gradually eliminated with the adoption of the junior high school (see page 1697). This organization complies with the twelve-year basis, but is divided into six years in the grades, three in junior, and three in senior high school, a system well adapted to another problem of organization, the Dalton plan (see page 498). The junior high system offers the advantage of departmental teaching, so teachers become specialists in presenting their subject. The new system also, by providing elective courses, keeps pupils in school who would otherwise quit.

THE HISTORY OF EDUCATION. A liberal professional preparation for teaching is hardly possible without a comparative study of educational progress as shown in past and present educational systems. It may take either of two general forms: That of education as a whole or that of formal pedagogy in particular. If the former, the field includes a history of the growth of all branches of learning and of the various institutions of civilization in general; if the latter, it is limited to the development of educational doctrine and the growth of systems and methods. There are commonly recognized five great epochs in educational history: the Oriental, the Classical, the Christian before the Reformation, the Reformation and the Modern Epoch. Each epoch is rich in instructive material, throwing light upon nearly every problem which the teacher meets and helping him to a more comprehensive view of the methods by which they may be solved. The following are among the standard texts on this subject: Compayré, Painter, Seeley and Williams. See, also, Boone's *Education in the United States*, Swett's *American Public Schools*, Klem's *European Schools*, Quick's *Educational Reformers*, Laurie's *Rise and Early Constitution of Universities*, Lang's *Great Teachers of Four Centuries*, Browning's *Educational Theories*, Butler's *Great Educators*, Winship's *Great American Educators* and the histories of education in the different states of the Union, published by the United States bureau of education.

The methods of teaching as well as the subject-matter must vary with the age and capacity of the pupil. In the earlier years nature-study supplies an abundance of material which may be used to introduce the elements of knowledge. The ability to correlate these elements in a systematic way and, in the advancing grades, gradually to differentiate them into the particular branches of knowledge developing from them requires great skill on the part of the teacher. A brief survey of nature-study and a few other subjects, with suggestions for teaching them will illustrate scientific method.

Among other titles in this work relating to the general subject of pedagogics are ADOLESCENCE; APPERCEPTION; ARITHMETIC; ASSOCIATION OF IDEAS; CHILD-STUDY; CORRELATION OF STUDIES; DRAWING; EDUCATION, HISTORY OF; EDUCATION, MODERN; FEELING; FROEBEL; GAMES; GEOGRAPHY TEACHING OF; GRAMMAR; HABIT; HISTORY TEACHING OF; INTEREST; KINDERGARTEN LANGUAGE-STUDY; LIBRARIES, HOW TO USE; LITERATURE FOR CHILDREN; MANUAL TRAINING; MEMORIZING; MENTAL DISCIPLINE; NATURE-STUDY; NORMAL SCHOOLS; PENMANSHIP; PHYSICAL EDUCATION; PSYCHOLOGY FOR TEACHERS; READING, TEACHING OF; SCHOOLS; SCHOOL EXCURSIONS; SCHOOL SANITATION; SCHOOL ORGANIZATION; SELF-ACTIVITY; SPELLING; STUDY; TEACHING, METHOD OF; and TEACHERS' INSTITUTES.

Ped'icel, the stalk of an individual flower. When a flower has no pedicel, it is said to be sessile.

Pedom'eter, an instrument used for measuring walking distances by marking the number of steps taken. It is also so constructed as to mark the revolutions of a carriage wheel when attached to it.

Pe'dro I of Brazil, born near Lisbon in 1798, dying there in 1834, was the first emperor of Brazil and the second son of John VI of Portugal. In 1807 he fled to Brazil with his parents on Napoleon's invasion of Portugal, and became prince regent of Brazil on his father's return to Portugal See BRAZIL and PORTUGAL.

Pedro II, son of the foregoing, was born at Rio de Janeiro, Dec. 2, 1825, became king on his father's abdication in 1831, and was declared of age in 1840. During his long reign he was distinguished by his love of learning and scholarly tastes, and manifested no small degree of devotion to the welfare and prosperity of his people; but in the revolution of 1889, when Brazil was declared a republic, he was forced to abdicate and withdraw to Europe. He died at Paris in 1891. See BRAZIL and PORTUGAL.

Pedro the Cruel, king of Castile and Leon, was born at Burgos, in Spain, Aug. 30, 1333. He was the only legitimate son of Alfonso XI, whom he succeeded in 1350. Three years after his accession he married Blanche de Bourbon, sister of the French king, but soon deserted her for his mistress, Doña Maria of Portugal, whose relatives he raised to the highest offices in his kingdom. Among many other victims of his cruelty were two of his natural brothers, whom he put to death. At length an insurrection was raised against him, under the leadership of his natural brother Henry. This he suppressed in spite of the excommunication of the pope, and the remainder of his reign was devoted to establishing his power and authority over his enemies and to long and bloody wars with Aragon and Granada. In 1366 Henry, who had fled to France, returned at the head of a body of exiles and revived his claims to the throne. Henry was supported by the pope, by Aragon and by France; but Pedro, by promises of money and territory, secured the assistance of Edward the Black Prince, and totally defeated Henry at Navarrete, April 13, 1367. Pedro so disgusted Edward by his cruelty to the vanquished, that the latter returned to France with his army, refusing any further alliance with a prince of such a character. In the autumn Henry returned with an additional force, the people flocking to his standard. Pedro's army was completely routed at Montiel, March 13, 1369, and he himself taken prisoner. He was carried to a tent, where a single combat took place between him and Henry, in which Pedro was slain.

Pedun'cle, the general stalk of a flower cluster.

Peeks'kill, N. Y., a pretty and historic borough in Westchester County, on the Hudson River and on the New York Central Railroad, 43 miles north of New York City. It has a number of manufactories, stove-works, foundries, machine shops, shirt and cigar factories, flour mills and blank-book and bookbinding establishments The town has many fine churches, schools, a public library, military academy, convent and an Episcopal school for young women. Population 15,245.

Peel, Sir Robert, an eminent English statesman, was born near Bury, in Lancashire, Feb. 5, 1788. He entered the house of commons in 1809 as a Tory, and immediately began to show the diligence and prudence that were marked features of his character. He held the office of secretary for Ireland from 1812 to 1818, and in this position displayed so unfriendly a spirit toward the Roman Catholics that they gave him the nickname of Orange Peel, which clung to him through life. From 1818 to 1822 Peel was out of office; but in the latter year he re-entered the ministry as home secretary, though in 1827 he retired. As home secretary he distinguished himself by a reorganization of the London police (*q. v.*) and by several other important measures. In 1820 Peel, as a member of the Wellington cabinet, proposed the bill for Catholic emancipation, and thereby separated himself from the Tory leaders. Next year (1830) the Wellington-Peel ministry was succeeded by a Whig ministry under Earl Grey, and in 1832 the reform bill was passed in spite of Peel's vigorous opposition. The general election of 1841 resulting in a decided victory for protection, Peel became prime minister with a large majority in both houses; but such was the demand for "cheap corn," that Peel was forced to yield and consent to the repeal of the corn laws. Peel retired in June, 1846, and, as a member of Parliament for Tamworth, generally acted with the Whigs, whose free-trade principles he had fully accepted. He died at London in consequence of a fall from his horse, July 2, 1850. Peel declined a peerage and the order of the garter, and was universally respected for ability as well as patriotism and high moral principle. See Guizot's *Robert Peel, Peel* by J. R. Thursfield in the Twelve English Statesmen Series; and Morley's *Life of Cobden.*

Pegasus (*pĕg'ȧ-sŭs*), in Grecian mythology, the winged horse which sprang from the blood of Medusa (*q. v.*) when she was slain by Perseus. He is said to have received his name because he first made his appearance beside the springs (*pegai*) of Oceanus. When Bellerophon sought to catch Pegasus for his combat with the Chimæra, he was advised to sleep in the temple of Minerva, and during his sleep the goddess appeared to him and gave him a golden bridle, with which he caught Pegasus, and by her aid overcame the Chimæra.

Peisistratos (*pī-sĭs'-trȧ-tŏs*) was a tyrant of Athens, the date of whose birth is uncertain, but who died in 527 B. C. Peisistratos gained his influence at the first by posing as the protector of the poor. He identified himself, therefore, with the party of the hills. He claimed that his life was in danger from the attacks of his enemies, showed wounds which probably were made for the purpose, and was granted a bodyguard. Once in possession of an armed force, Peisistratos seized the citadel. He governed Athens well and wisely, and twice submitted to exile only to regain his power. The word tyrant as applied to him means little more than ruler; and became obnoxious only at a later date.

Pekin′ or **Peking′**, the northern capital of the Chinese empire, is situated on a sandy plain 100 miles from the sea (Gulf of Pe-chili) and 60 from the great Chinese wall. The city consists of two parts: The northern or Tartar city and the southern or Chinese city. The northern city is surrounded by a wall 60 feet high and from 40 to 50 wide, and the southern city by a wall 30 feet high and from 15 to 25 feet wide. The wall and moat are a little over 20 miles in length. Not counting the cross-wall, the entire circuit measures about 21 miles, inclosing an area of about 25 square miles. Peking has sixteen gates, over each of which is raised a tower 100 feet high and of imposing appearance. Within the northern city is the Tsze-kin-ch′ing or Prohibited City, with a circumference of two miles, where the emperor has his residence. Peking has railway communication with Tien-tsin and with the Gulf of Pe-chili at or near Taku.

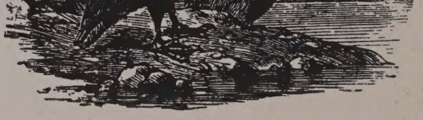
Peking is one of the most ancient cities of the world. On the same site stood the metropolis of the feudal state of Yen, whose history can be traced back to the 12th century B. C. When Kublai Khan became emperor of all China in 1280 A. D., he made Peking his capital, where he was found by Marco Polo. In the language of Dr. Williams "Peking stands to-day, like the capitals of the ancient Roman and Byzantine empires, upon the debris of centuries of buildings." But little was known of the city, however, until 1860, when the English and French armies appeared before its walls and compelled the emperor to conclude the treaty of Tien-tsin or have his capital destroyed. Since that time the Chinese government has permitted ambassadors of other nations to have a residence in Peking, although they are not allowed to enter Tsze-kin-ch′ing or Forbidden City. See BOXER RISING and CHINESE EMPIRE. The population is estimated at 700,000. See Williamson's *Journeys in North China;* Williams' *The Middle Kingdom;* and Martin's *The Siege in Peking.*

Pekin (*pē′kĭn*), **Ill.,** city and county-seat of Tazewell County, about 11 miles from Peoria. It is in a fertile, agricultural section, the chief products of which are corn and wheat, and in the vicinity are extensive coal deposits. Pekin manufactures agricultural implements, wagons and carriages, fertilizers, organs, furniture, foundry products, ammonia, alcohol, beet-sugar, glucose, brick and tile. There are admirable public schools and a free library. Pekin has the service of several railroads, and has freight and passenger traffic by steamboat with ports on Illinois River. Population 17,000.

Pelas′gians, a term applied to the most ancient inhabitants of Greece, Italy and some portions of Asia Minor. In Homer the Pelasgi seem to have been an unimportant tribe living in Thessaly. Herodotus seems to regard them as a race of barbarians who had occupied Hellas prior to the Hellenes. Thucydides, on the other hand, says that they were the most numerous of the various races that inhabit Greece. Amid such conflicting testimony it is impossible to form any definite conclusions in reference to the Pelasgians; but we are at least justified in regarding them as an active and stirring people, chiefly intent upon agricultural pursuits. Yet they were no less brave and determined when attacked and driven to self-defense.

Pelew′ Islands, a group of about twenty-five islands (since 1919 belonging to Japan), lying southeast of the Philippines in the Pacific, at the western extremity of the Caroline Archipelago. These islands are mountainous, wooded and surrounded with coral reefs. Total area, 170 square miles. The inhabitants, about 10,000 in number, belong to the Malay race. The soil is fertile, and the climate healthy. The Pelew Islands were discovered by the Spaniards in 1543, and sold to Germany in 1899.

Pel′ican, a water-bird with webbed feet and a long bill having a pouch on the under surface. The upper part of the bill hooks over the lower. Pelicans are large birds with powerful wings, related to the cormorants and the gannets. They occur in the Old and New Worlds, being mostly confined to the tropics and the warm parts of the temperate regions. They live upon fish, and at times the pouch on the lower jaw is greatly distended with stored fish to be eaten at leisure or carried home to the young. In southern California and Florida the brown pelican is a familiar object. This bird is about fifty inches long with a wing-spread of more than six feet, a bill a foot long and a purple pouch. After becoming three years old the bird is of varying shades of brown, the neck a very dark


PELICAN

brown broken by white. These birds show themselves friendly to man as well as social among themselves. They nest in large colonies, a notable colony possessing Pelican Island in Indian River, Florida. Their fishing in the ocean breakers is thus described by Hornaday: "They sail so near the water it seems a wonder it does not strike them; but they rise over the incoming waves and lower again into the trough with the utmost precision, always keenly alert. All of a sudden, the wings are thrown out of gear, and a fountain of flying spray tells the story of the plunge with open pouch for the luckless fish." In Florida another bird of the same family once abounded, the great white pelican, but it is now rare. It is a bird of noble size, sixty-one inches in length, with spread of wings of over eight feet. Every summer a colony breeds in Yellowstone Park, and in winter the white pelican is found in Texas. See Hornaday's *American Natural History*.

Peloponnesus (*pĕl'ō-pŏn-nē'sŭs*), a peninsula, now called the Morea, which formed the southern part of ancient Greece, so called by the Greeks, because it almost is an island and Pelops was said to have founded a colony. It is about 140 miles long and nearly the same distance in extreme breadth. It is connected with northern Greece by the Isthmus of Corinth, which separates the Gulf of Corinth from the Saronic Gulf. In the center a lofty circular ridge incloses an elevated basin, the famous vale of Arcadia. Among its ancient cities were Sparta, Argos, Mycenæ and Mantinea. In modern Greece the term is applied to a group of nomarchies or provinces, which among others embrace Argolis and Corinth, Achaia and Elis, Arcadia, Messina and Laconia. Its area is about 8,000 square miles, with a population of nearly 900,000.

Pe'lops, in Grecian mythology, the grandson of Zeus and son of Tantalus. His father invited the gods to a banquet, and, in order to test their superior knowledge, killed Pelops and served his remains at the table. They were not deceived and refused to touch the horrible food set before them; but Demeter, absorbed with grief for the loss of her daughter, ate part of a shoulder without knowing what kind of flesh it was. The gods then ordered the remains to be thrown into a cauldron, out of which Clotho brought the boy alive, an ivory shoulder being given in place of the one eaten. Hence his descendants, the Pelopidæ, were said to have one shoulder white.

Pem'broke, Ont., county-seat of Renfrew County, lies on the southerly bank of Ottawa River at the point called, because of its greater width, Lake Allumette. The islet opposite, bearing the same name, marks the farthest point reached by Champlain in 1613 during his exploration and discovery of the Ottawa valley. A large trade in sawed lumber is done, and considerable manufacturing of other kinds. The city is the principal settlement of upper Ottawa Valley. Population 5,156.

Pem'mican, a condensed food made by cutting lean meat into thin strips and, after thoroughly drying them, reducing them to powder and mixing the substance with boiling fat. It is much used by Arctic voyagers.

Pen (from the Latin *penna*, a feather), an instrument for writing with fluid ink. When the ancients wrote upon papyrus or parchment, they used a reed, and when they used tablets of wood or stone they wrote with a pointed stylus of bone or other material. Reed-pens are still used by Persia and some other countries, as a metal pen does not suit their mode of writing. The Chinese and Japanese write with a small brush or hair pencil. When paper was introduced into Europe for writing purposes, quill-pens came into general use and continued in use to the beginning of the 19th century. The first English patent for the manufacture of steel pens was issued to Bryan Donkin in 1803; but the credit of bringing them into general use should be divided among James Perry, John Mitchell, Joseph Gillott and Sir Josiah Mason. Perry began pen-making at Manchester in 1819, using the best Sheffield steel for the purpose. He removed to London and had developed the pen-trade to tolerably large proportions before the Birmingham manufacturers caused a revolution by the invention of machinery in the manufacture of pens, thus enabling them to be sold cheaply and become articles of common use. The growth of the trade may be seen from the fact that the weekly average of pens manufactured in Birmingham is 30,000,000. The manufacture of gold-pens has progressed to a much greater extent in the United States than in any other country, the annual product amounting to nearly $2,000,000 in value. The gold-pen goes through no less than forty-five processes, from the gold bar purchased from the assay office to the highest finished article of commerce To give hardness to the point of the pen it is tipped with iridium The United States imports half a million gross of steel-pens annually and manufactures nearly two million gross at Camden, Meriden and Philadelphia, the steel used being chiefly imported from Birmingham. In the stylograph or fountain-pen the nib is dispensed with, a finely tapered point connecting with the barrel containing the ink. The first fountain-pen was brought out in 1848.

Penang', an island in the Strait of Malakka, lying off the Malay Peninsula, between it and Sumatra, belonging to Great Britain. With Singapore, Wellesley and Malakka it forms the crown-colony of Straits Settlements. It comprises an area of 107 square miles and contains about 250,000 inhabitants. The coast is very irregular, being indented by several bays. The surface is intersected by a range, the highest point of which is about half a mile above the sea. The soil is fertile, and rice, tapioca, pepper, cloves, nutmegs and other tropical fruits and vegetables are grown. Georgetown, in the north, is the capital. It has a good harbor and considerable trade, Adjoining native states are under British protection, and contain the richest tin-fields in the world, besides valuable forests yielding rubber, gutta-percha and gums. A fine club and golf links are maintained by the English residents.

Pen′cil. A slender stick of black lead, slate or chalk, inclosed in a round piece of wood is called a pencil, but the term is also applied to small hair-brushes, used by artists, and to these the name was originally given. For a long time graphite or plumbago from the Cumberland mines in England furnished the "leads" for the best pencils ever made; and since these mines were exhausted vast quantities of the same material have been found in Siberia. By a method patented by Brockedon in 1843 this material is freed from impurities by grinding it to powder, and is then formed into solid blocks by subjecting it to heavy pressure in cases from which the air is removed. The manufacture of black lead and colored pencils is carried on extensively at Nuremberg, where there are more than twenty factories, which employ several thousand hands and annually produce about 250,000,000 pencils.

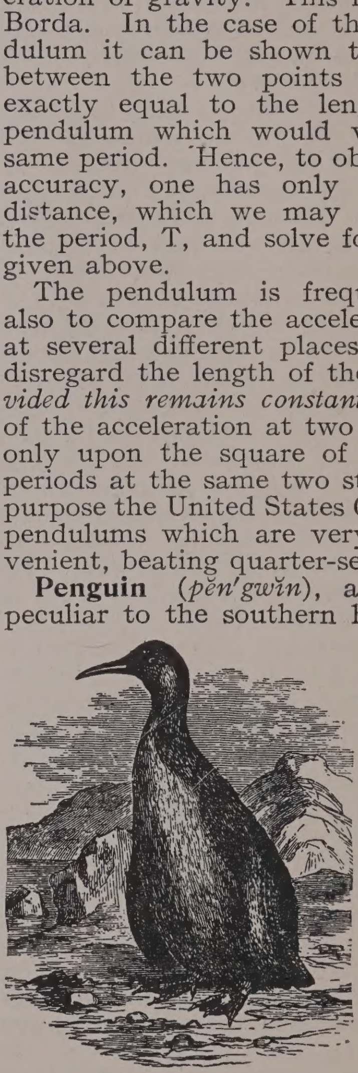
Pen′dulum, literally a hanging body, is used in physics to denote any body performing isochronous or nearly isochronous vibrations. (Isochronous means equal-timed). Thus a magnet freely suspended so as to vibrate in a horizontal plane is sometimes called a *magnetic* pendulum. An ordinary clock pendulum is called a *gravitational* pendulum. A brass rod, so suspended by a wire as to vibrate in a horizontal plane, is generally known as a *torsion* pendulum. Space permits us to discuss only the gravitational pendulum. This simple but elegant instrument serves two principal purposes, each of which was first pointed out by Huygens, the great Dutch physicist (1673). One use is that of a time-measurer, an application based on the fact that, so long as a pendulum remains of constant length and swings through the same angle, it vibrates at a constant rate. In practice its length is kept constant by "compensation" and its angle of swing is kept constant by means of a spring which gives it a little push at each vibration. (See CLOCK.) The second use is as an instrument for measuring the acceleration of gravity at various points over the surface of the earth. This is generally done in two ways: (1) By suspending a heavy metallic sphere of known radius by means of a fine wire of known length and observing the period of vibration; or (2) by suspending a bar of metal from one of two such points that it has the same period of vibration from whichever point it be suspended. The former method is a near approximation of what is called a *simple* pendulum, namely, a heavy particle suspended by a massless thread; the latter is a *reversible compound* pendulum. It can be proved by dynamics that the period, T, of a simple pendulum whose length is l, is given by the equation

$$T=2\pi\sqrt{l/g}$$

where g is the acceleration of gravity at the place of observation. Using this equation for the brass ball, suspended by a wire, and making some slight corrections for the wire and for the diameter of the ball, one may obtain quite an accurate value of the acceleration of gravity. This method is due to Borda. In the case of the reversible pendulum it can be shown that the distance between the two points of suspension is exactly equal to the length of a simple pendulum which would vibrate with the same period. Hence, to obtain g with great accuracy, one has only to measure this distance, which we may call l, determine the period, T, and solve for g the equation given above.

The pendulum is frequently employed also to compare the acceleration of gravity at several different places. Here we may disregard the length of the pendulum, *provided this remains constant*, since the ratio of the acceleration at two stations depends only upon the square of the ratio of the periods at the same two stations. For this purpose the United States Coast Survey uses pendulums which are very short and convenient, beating quarter-seconds.

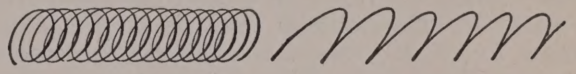
Penguin (*pĕn′gwĭn*), a swimming bird peculiar to the southern hemisphere. The birds are diving swimmers. They are very awkward on land, but wonderfully expert in water. It is said they can outswim fish. Their wings, which do not suffice for flying, are paddle-shaped, and in swimming are brought alternately into use. In diving and in swimming under water only the wings are used, the feet serving as a rudder. The feet are placed so far back on the body that the bird is erect when standing. They have a smooth, scale-like plumage adapted for slipping through the water. The birds live mostly on the water and go on shore


KING PENGUIN

only to breed. During the breeding-season they are found in great numbers on rocky islands far from habitations, as on the Falklands, Kerguelen Islands and rocky parts of New Zealand. There are about twenty species; the emperor penguin is the largest of them all, one specimen weighing 78 pounds. The emperor stands about three and a half feet high, has a coat that reminds us rather of fish-scales than feathers; its front is white, head black, legs and feet feathered to the claws. It is thus graphically described by Hornaday: "In its erect posture its wings seem like arms, and its queer manner of talking, scolding and prying into man's affairs makes this bird seem more like a feathered caricature of a big, fat human being than an ordinary diving bird."

Penin'sular War. The quarrels between Charles IV king of Spain (*q. v.*) and Ferdinand, his son, gave Napoleon an opportunity (1807) of interfering in the affairs of that country. In pursuance of a treaty with Charles (*q. v.*) he had sent an army into Portugal under Junot (*q. v.*), by whom Lisbon was seized, and the members of the royal house were obliged to flee to Brazil. For the pretended purpose of supporting Junot's army other French troops occupied Valladolid, Salamanca and other important positions in Spain, including Madrid where Murat was in command. Riots at Madrid, Toledo and other places caused the feeble king such alarm that he surrendered his crown to Napoleon, who at once bestowed it upon Joseph, his brother, then king of Naples. Joseph Bonaparte was accordingly proclaimed on July 24, 1808. But the Spanish provinces refused to recognize Joseph, and rose against the French in all directions. Assistance was supplied to the patriots of Spain and Portugal (*q. v.*) by Great Britain; and on the 12th of July, 1808, Sir Arthur Wellesley (afterwards Duke of Wellington) was sent to Portugal with 30,000 men. Wellesley defeated Laborde at Rolica and Junot at Vimiera, but Sir H. Dalrymple concluded the convention of Cintra with the French, who evacuated Portugal during September, 1808. Napoleon continued to send large re-enforcements to Spain and came to Madrid to direct the operations of his forces; and when Wellesley was again sent out, in the spring of 1809, he found himself confronted by nearly 400,000 French troops, in eight army-corps, commanded by six marshals and by Generals Junot and St. Cyr. Wellesley at once proceeded to active operations; but it took a conflict of five years and many hard-fought battles to drive the French forces out of Spain. For his services Wellesley was created Duke of Wellington (*q. v.*), and received $2,500,000 from the English parliament. This war is sometimes called the War of Spanish (or of Portuguese) Independence.

Pen'manship. The art of handwriting as taught in the elementary school. Three typical systems of writing forms are taught in American schools: the slant (*them*), the medial (*them*) and the vertical system (them). The slant system represents the system of writing taught up to the present school generation. It was superseded by the *vertical* system largely because of ease of teaching and the lessened strain in reading. At present the *medial* system, which is halfway between the other two systems, is becoming prevalent. The main requirements in the teaching of penmanship are legibility, speed, ease and individuality. The usual demand has been for legibility and speed. Since the typewriter and the stenographer have come into widespread use, the insistence upon a very high degree of accuracy of form and rapidity in copying has decreased, and some individuality in writing for ease in identification of signatures etc. has become more important relatively. The teaching of penmanship proper usually begins in the second school-year, slightly before the first work in written composition. Some movement-exercises are sometimes given in the first year. The first work usually is with large forms upon the blackboard, the teacher setting the copy and the children imitating. Work in penmanship at the seats follows later, the pencil frequently preceding the use of pen and ink. In seat-work the copy either is set by the teacher or is taken from a printed copy-book. Much practice in the repetition of the copy follows. The exercises in the copy-books represent a gradation of difficulties from grade to grade. In some cases the copy is constantly kept before the child as a standard. In others it is used only for a short period, the child later comparing his own work with his image or standard of what the work ought to be. Dictation supplements the exercises, the final test being found in the penmanship that is seen in the child's compositions where the attention is mainly upon the expression of thought. One group of teachers strives for accuracy of form, at first letting the child write slowly, almost drawing the letters, and then gradually quickening the speed of writing. Where this is done, rapid movement-exercises with circles, ovals or other forms are given parallel to the slower writing of letters, words and sentences. Another group of instructors lays the emphasis upon rapidity of writing from the beginning, gradually striving for a more nearly correct form. Where individuality is a standard in the teaching of writing, the childern are first required to get correct form without any variation. When this is fairly-well achieved, such personal



variations as appear and do not interfere seriously with legibility are allowed to persist. In obtaining greater accuracy and speed, the point is soon reached where a large amount of effort is required to make small gains. Further effort seems wasteful. Hence there is the very general tendency for penmanship to disappear as a specific subject about the end of the sixth or the seventh school-year. The rigid insistence upon a certain position of body, arm, hand and fingers which characterized the former teaching of penmanship is seldom found in present day methods of teaching. The child's own comfortable position is allowed to a far greater degree, provided it does not interfere with hygienic considerations. The attempt to make children write by a whole-forearm movement has also been modified. Slight finger-movement is permitted in combination with the whole-arm movement.

Penn, William, founder of the State of Pennsylvania, was the son of Admiral William Penn, and was born at London, on October 14, 1644. Penn studied at Christ Church, Oxford, and there became a convert to Quakerism. In 1668 Penn was thrown into London Tower for his writing of *The Sandy Foundations Shaken.* While in prison he wrote *No Cross, No Crown* and *Innocency with Her Open Face.* He was liberated through the influence of the Duke of York, afterward James II. In 1670 Admiral Penn died, leaving his son £1500 ($7,500) a year, and claims upon the government for £16,000 ($80,000). In 1681, in lieu of his monetary claim, Penn obtained territory comprising the present State of Pennsylvania. He desired to call it Sylvania, but Charles II insisted on the prefix Penn, in honor of his father. In October of 1682 Penn held his famous interview with the Indian tribes. He concluded a peaceful arrangement for the purchase of their lands, and for fifty years his colony remained unmolested by them. Penn planned and named Philadelphia, and for two years managed affairs in the wisest, most benevolent and liberal manner. Not only Quakers, but persecuted members of other churches sought refuge in his colony, where religious toleration was fully recognized and respected. In 1684 Penn returned to England to exert his influence in favor of his persecuted brethren at home, in which he was so far successful that soon after James II came to the throne (1685) 1,200 imprisoned Quakers were set at liberty. After the accession of William III, Prince of Orange (1688), Penn was accused of treason and conspiracy, but was acquitted. In 1699 Penn paid a second visit to Pennsylvania, where his colony required his presence. His two years' stay was marked by many useful measures and by efforts to improve the condition, not only of the colonists, but of the Indians and Negroes. He returned to England in 1701. When an agent of Penn's died, he left claims which the latter refused to pay. He was committed to Fleet Prison, where he remained until friends procured his release by settling the claims. He died on July 30, 1718.

Pennell, Joseph, an American artist and engraver, was born at Philadelphia in 1860, of Quaker parentage. He married Elizabeth Robbins, and together they travelled almost continuously, writing and sketching. In this time they visited many of the cities of the Old World and sailed down most of its historic rivers. Pennell's works are numerous, all illustrated in that pen-and-ink style for which he is justly famous. His first book was *A Canterbury Pilgrimage.* Among his other works are: *Lithography and Lithographers; Pictures of War Work in America; Etchers and Etching,* and *The Whistler Journal* which he edited with his wife. In 1914 Pennell served as chairman of the International Exhibition at Leipsic. In 1915 he was chairman of the Panama-Pacific Exposition. Here he was awarded a commemorative medal. He died in 1926.

Pennsylvania (*pĕn-sĭl-vā'nĭ-ȧ*), one of the Middle Atlantic states, is situated at the center of the arch formed by the original thirteen states of the Union, from which location it received the popular name of the "Keystone State." It is bounded on the north by Lake Erie and New York; on the west by West Virginia and Ohio; on the south by Delaware, Maryland and West Virginia, and on the east by New York and New Jersey. The Delaware River marks the entire eastern boundary line, and the "Mason and Dixon's line" follows the southern boundary. The name Pennsylvania is derived from that of the founder, William Penn, and means "Penn's Woods." This once beautifully wooded land extends over an area of 45,126 square miles, 294 square miles of which are water, exclusive of 891 square miles of Lake Erie.

Surface and Drainage. Ranges of the Appalachian Mountains divide the surface of the State into three natural regions. The southeastern section is crossed by the Piedmont belt and lies mostly in the Coastal Plain, but toward the northwest it is diversified by beautiful rounded hills interspersed with broad limestone valleys. The great Appalachian Mountain system crosses the State from the northeast to the southwest, and beyond that lies the Appalachian Plateau, succeeded by a small area of lake plains along the coast of Lake Erie. The southeastern portion rises steadily from elevations varying between seventy-five and 500 feet to the base of the mountains. The Appalachian region occupies about one-fourth of the entire area of the State in a belt from seventy-five to 160 miles wide, comprising two main ranges known as the Blue and the Allegheny Mountains, and a multitude of small ranges lying between and beyond them. The Blue Mountains are actually a continuation of the Kittatinny range of New Jersey and the Shawangunk Mountains in New York. One of the most striking scenes in the mountain region is the break in the ranges known as the Delaware Water Gap, as through it the

Delaware River flows. The elevated region between the Blue and the Allegheny Mountains is known as the Appalachian Plateau. Great ridges in almost unbroken parallel lines run the length of this Plateau, rising from 500 to 1,000 feet above the floor. Among the many short ranges that traverse the Plateau are the Sharp, Locust, Mauch Chunk, Catawissa, Tuscarora, Mahatango, Nescopech, North Central, Bald Eagle and the Laurel Hill. There are not many prominent peaks in this region, the entire mountain region being fairly uniform in height. The highest point in the State is Negro Mountain in Somerset County, which attains a height of 3,213 feet. Among other high peaks are Blue Knob, 3,136 feet high; Devies Mountain, rising to 2,760 feet, and Pocahontas, 2,660 feet in height. All of these are situated in the Alleghenies. No summit of the Blue Mountains, rises to a height of 2,400 feet, and the general elevation of this range is less than 2,000 feet. Most of the shorter ranges are low-lying and rounded, of sandstone formation, separated by narrow valleys. From this mountainous district the land extends in a broad plateau, occupying about one-half of the entire area of the State. This plateau is broken in the east, becomes rolling and undulating as it slopes westward, and descends toward Lake Erie by declivities. From an elevation of about 250 feet the drop to the Lake Erie plain is sudden. A high wall of sand and clay formation follows the Lake Erie shore, with a narrow beach at its base. Originally, this entire surface was heavily wooded, making Pennsylvania the leading lumber-producing state of the Union in 1860. Wasteful cutting of timber and raging forest fires have, however, greatly reduced the forest acreage until only about one-third of the State is covered with forests, about twelve million acres in all. Pine and hemlock are found in the mountains, and hardwoods in the southeastern part of the State. Reforestation has been extensive, aided by the 1921 appropriation of $1,870,000 to the State Department of Forestry, the largest ever made by any State legislature to such a department. In that year fifty steel towers were erected in the State for observation and detection of forest fires. This extensive reforestation was made necessary partly by the disastrous floods that have occurred in Pennsylvania since the great woodlands were cut away.

The soils are generally fertile. In the southeastern part of Pennsylvania are to be found clays, silt loams, and sandy soils from the underlying crystalline rocks. Beyond this region is a belt of clays, and clay and shale loam formed by erosion of the red triassic sandstones. In the limestone valleys the soils are loams and silt loams. The Appalachian Valleys are composed mostly of loams, which are sandy, stony or silt, with a small amount of clay soil in some places. Beyond these mountains the same soils prevail to the northwest, and the northeast, where glacial deposits have left much the same combination of soils, from the sandstones, shales and limestones that prevailed. The Erie plain is covered with loam of clayey, sandy and gravelly type, deposited in the bed of the glacial lake that formerly covered this region. The most fertile region is to be found in the valleys west of the Delaware, many of which are also beautiful and picturesque, as are the Wyoming and the Lebanon Valleys. These soils are chiefly eroded limestone, with alluvial deposits near the rivers. The Cumberland Valley west of the Susquehanna, in the southern part of Pennsylvania, is also extremely fertile. The soils are partly determined by the rivers and streams of the State, which form three general drainage basins, flowing southeastward toward the Atlantic Ocean, westward to empty into the Ohio or northwestward to Lake Erie. The Delaware River flows along the entire eastern boundary, a beautiful scenic route. Into this river empty a number of tributaries, chief of which are the Lackawanna, the Lehigh and the Schuylkill. The Susquehanna crosses the State from north to south, winding among the mountains which it pierces by a number of gaps, and receiving the waters of the West Branch and the beautiful blue Juniata, both from the west. The Monongahela drains the southwestern corner of Pennsylvania, and the Allegheny, with its many tributaries, drains the northwestern corner; these two rivers unite to form the Ohio. The extreme northwestern portion drains directly into Lake Erie. Besides these three drainage systems, there is a small section of the north central part of the State that is drained into Lake Ontario through the Genesee River, and another small section along the central southern boundary that drains into the Potomac River. There are no large lakes, although in northeastern Pennsylvania there are 300 lakes within nine counties, and there are many lovely mountain towns.

Climate. The climate of the State varies considerably with the topography. In the southeastern portion of Pennsylvania it is mild and equable, as that section is near enough to the ocean to be tempered in climate by it. In the mountain region the valleys have marked extremes of weather, being hot in summer and suffering severe cold in winter. As Lake Erie is approached, again the tempering effect of a large body of water is felt, and extremes are less noticeable. The mean annual temperature ranges from fifty-two degrees Fahrenheit in the southeastern portion to forty-seven degrees in the northeastern region and forty-nine degrees at Lake Erie. At Philadelphia the extremes are six degrees below zero and 103 degrees above; at Pittsburgh, twenty degrees below zero and 103 degrees above. The mean annual precipitation also varies, being 41.2 inches at Philadelphia, 36.4 inches at Pittsburgh and 41.3 inches at Lake Erie. There is heavy snowfall on the western plateau, because of the mountains.

Minerals. The extent and value of the

mineral wealth of Pennsylvania is so great that the State stands practically alone in this field in the Union. This is due largely to the vast resources of coal. Pennsylvania ranks first in coal production in the Union. It is one of the greatest coal-producing regions of the world. It produces nearly half the steel of the United States. Pittsburgh is the center of the greatest metal production ever achieved in a single locality, and has made more millionaires than any other one industrial locality in the country. Scranton is the greatest hard coal center of the United States, and also produces much steel. With the exception of small fields in New Mexico and Colorado, Pennsylvania contains the only anthracite coal deposits in the United States, in fields that extend over an area of 480 square miles in the eastern part of the State. There is also a field of bituminous coal with an area of 14,200 square miles. In 1932, there were produced 76,028,000 tons of bituminous coal and 49,350,000 tons of anthracite, making a total of 125,378,000 tons. The annual production remains steadily around the hundred-million mark. Pennsylvania is also one of the foremost states in the Union in oil production, and leads in the production of natural gas. In 1932, 12,403,000 barrels of petroleum were produced; in 1930, 88,706,000,000 cubic feet of natural gas, and in 1931, 14,399,000 gallons of natural gasoline or petrol. Iron ore resources are not extensive, there being 102,838 gross tons mined in 1932. Pennsylvania imports large supplies of iron ore, however, chiefly from Minnesota, and produced 2,069,553 long tons of pig iron in 1932. There are important quarries in the State, which produce sandstone, bluestone, limestone, dolomite, crystalline, graphite, garnet, soapstone, fire-clay, and glass-sand. There is a large output of coke and cement.

Production and Industry. This important State has greatly diversified production, and agriculture, market-gardening, fruit-growing, horticulture and forestry are all extremely important. In 1930 there were 172,419 farms comprising 15,309,485 acres, of which 7,813,826 acres were under cultivation. Pennsylvania usually leads in the production of buckwheat, of which 2,070,000 bushels were produced in 1932. Other important agricultural crops, with their productions in 1932, include: winter wheat, 13,465,000 bushels; rye, 1,550,000 bushels; corn, 46,435,000 bushels; oats, 24,072 bushels; potatoes, 21,450,000 bushels; tobacco, 43,363,000 pounds, and tame hay, 2,605,000 tons. Fruit growing is an important industry. In 1932 there were 9,537,000 bushels of apples produced. In the same year there were produced 1,676,000 bushels of peaches, 384,000 bushels of pears, and 22,970 tons of grapes. Dairy farming is an important occupation. In 1932, the total number of cattle was 1,398,000, of which 1,041,000 were dairy cows at least two years old. The wool clip in 1931 amounted to 3,248,000 pounds.

The industries of the State have been built largely on basic elements, and center in metal production and minerals. In 1930 there were 20,065 industrial establishments in the State, employing 1,191,983 workers who produced goods valued at $6,531,113,200. Metals lead in value, followed closely by textiles, food products, chemicals, paper and printing, clay, glass and stone, leather and rubber products, lumber, and tobacco products. Pennsylvania possesses 34.5 per cent of the blast furnace capacity of the entire United States, 36.4 per cent of its iron and steel manufactures and 40.9 per cent of its silk manufactures. The great steel industry leads in value and importance and includes large foundries and machine shops, electrical works, railroad shops, structural iron works, and automobile factories. Other important industries include the manufacturing of textiles and clothing, petroleum refining, printing and publishing, and food products.

Transportation. In 1932 there were in Pennsylvania 11,155 miles of steam railway and 3,621 miles of electric railway. The highway mileage was 13,384, 10,270 miles of which were hard-surfaced. A number of the rivers of the State are navigable, notably the Susquehanna, the Delaware, the Allegheny and the Monongahela. Canals were formerly of the utmost importance and Pennsylvania possesses two good canals. The lake front also affords excellent transportation, with a good port. Philadelphia provides an outlet to the Atlantic Ocean, as its situation on Delaware River opening into Delaware Bay makes it an important port, not only of Pennsylvania, but of the United States as well.

Population. The population of Pennsylvania in 1930 was 9,631,350, an increase of 10.6 per cent over that of 1920. Pennsylvania is the second most populous state in the Union. Of the total population, 12.8 per cent were foreign-born whites; 4.5 per cent Negro, and 67.8 per cent urban. The larger cities, with their populations in 1930, are: Philadelphia, 1,950,961; Pittsburgh, 669,817; Scranton, 143,433; Erie, 115,967; Reading, 86,626; Altoona, 82,054, and Harrisburg, the capital, 80,339.

Education. The State ranks high in its provision for educational facilities. In 1930 the illiteracy rate was 3.1 per cent in the State, only 0.6 per cent being among the native whites, and 15.4 per cent among the foreign-born. School attendance is compulsory for children between the ages of eight and fourteen. Employed children who have progressed beyond the sixth grade are required to attend continuation school. In 1930, there were 12,000 elementary schools in the State with an enrollment of 1,495,915 and 43,206 teachers; 1,188 high schools with an enrollment of 406,454 and 17,840 teachers. There were fourteen State Normal schools with 10,284 students and 614 teachers. There are many institutions of higher learning, chief of which is the University of Pennsylvania, founded at Philadelphia in 1740. In 1932 this institution had an enrollment of 8,235 with a faculty of 1,215. The University of Pittsburgh in that year enrolled 13,525 students and had a faculty numbering 856. Other important institutions of higher learning are Temple University; Pennsylvania State College; Duquesne University; Carnegie Institute of Technology; Drexel Institute; Lehigh University; Lafayette College; Swarthmore College; Bryn Mawr College, and Haverford College.

Government. Pennsylvania is divided into sixty-seven counties. The General Assembly is composed of a Senate of fifty members, elected half every two years for a four-year term, and a House of Representatives of 208 members elected for two years. The State is represented in the National Congress by two Senators and thirty-four Representatives.

History. The shores of Chesapeake Bay and Delaware Bay were explored by Verrazano in 1524, by Hudson in 1609, and by May in 1614. Undoubtedly these explorers saw the beautiful "Penn's woods" beyond. Part of the territory was granted to Sir Walter Raleigh in 1584 by Queen Elizabeth, and part in 1606 to the London Company by James I. The first settlement, however, was made by the Swedes under Peter Minuit in 1638, when New Sweden was founded on the Delaware River. In 1655 the Dutch of New Netherland conquered these Swedish settlements, and in 1664 they were granted to the Duke of York together with the lands between the Delaware and Connecticut rivers. The Duke of York in turn granted the region between the Delaware and the Hudson to George Carteret and Lord Berkeley. The latter sold out his interest to Edward Byllinge, a Quaker who became insolvent in 1674. One of his trustees was William Penn, who thereupon became interested in America. In 1680 Penn was granted the region which forms the present State of Pennsylvania, over which he was declared absolute lord for payment of a fixed annual rent of two beaver skins. There followed a number of years of difficulty over boundary claims but in 1763 these were at last adjusted. Philadelphia was founded in 1682, and German immigrants settled at Germantown nearby. Penn's treaty with the Indians in 1682 led to almost a century of peace and freedom from the usual ravages of the frontier states. The surveying of the disputed southern boundary in the years between 1763 and 1767 by Mason and Dixon led to the establishment of the famed "Mason and Dixon's line." In 1692 William III revoked Penn's charter because Pennsylvania would not provide defense against the French. In 1694, however, it was restored. Not until after Braddock's defeat in 1775 did any disturbances arise with the Indians. Pennsylvania played a prominent rôle during the American Revolutionary War. The Continental Congress met in Philadelphia in 1774. The State voted money in 1775 to aid Massachusetts. Pennsylvania was ruled by a Council of Safety until 1776, when a State government was organized. The State was a base of operations for General Washington during much of the war. Philadelphia was the seat of the Congress except for the period of Howe's occupation from 1777 to 1778. Pennsylvania ratified the Constitution of the United States on December 12, 1787, an act of the most vital importance, as it was one of the largest States and truly the "Keystone." In 1780 provision was made for the gradual emancipation of the slaves within the State. The present State Constitution was adopted in 1873. Pennsylvania was distinguished as the first state to respond to Lincoln's call to arms in the Civil War. It was invaded by the Confederates in 1863 and 1864. The battle of Gettysburg, one of the most decisive battles of the War was fought here in July, 1863. The industrial growth of the State has been remarkable. In 1876 the Centennial Exhibition was held in Philadelphia. In 1889 came the disastrous Johnstown flood, in which 2,000 persons lost their lives. In 1897, the capitol at Harrisburg was burned. There have been many serious strikes, notably the railroad strike of 1877, the steel strike of 1892 and the coal strike of 1902, but Pennsylvania has successfully surmounted each difficult situation.

Pennsylvania Dutch or **Pennsylvania German,** a High German dialect which has prevailed in the southeastern counties of the State of Pennsylvania since 1683. In that year emigrants from the Lower Rhine Provinces, Bavaria, Saxony, the Rhenish Palatinate, Württemberg, and Switzerland, fled to America in seeking an escape from the armies of Louis XIV and religious persecution. Pennsylvania Dutch is really a Franconian dialect of German, but in the course of years many English words have been added. The language is called Dutch primarily because the immigrants referred to themselves as "Deitsch" or "Deutsch German."

The term has come to be applied to that group of people embracing the beliefs and customs and speaking the language of the Pennsylvania Dutch. Since the days of their early history in Pennsylvania they have been an industrious, thrifty, and intensely religious people. Many of them even to-day still adhere to the beliefs practised by the Mennonites, Amisks, and the Dunkers. Their first thought has ever been one of religion. The Pennsylvania Dutch have also been deeply interested in education and aided in establishing many schools and colleges throughout their State. These early settlers accomplished much for the welfare of their adopted country. They dwelt in small communities where they were bent upon agricultural pursuits or industrial enterprises. The dialect has had but little literary cultivation.

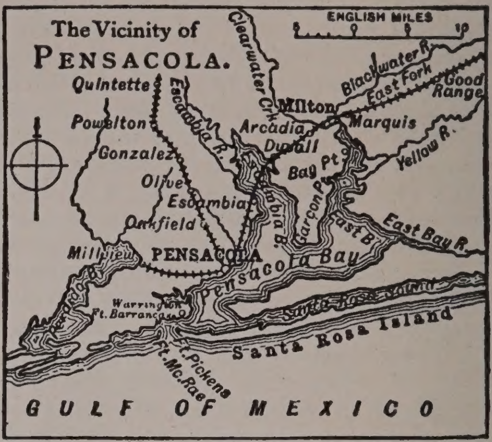
Pennsylvania, The University of, traces its origin to a Charity School started in Philadelphia in 1740, which was succeeded by the "Academy" in 1749, organized by Benjamin Franklin. In 1753 it obtained a charter which described it as a college. In 1755 the Academy became the College of Philadelphia.

In 1791 it was incorporated by a new charter as the University of Pennsylvania. Its Medical School, founded in 1765, is the oldest in the United States. The University now comprises the following departments: The College, in which are included courses in arts, science, biology, music, summer school, and courses for teachers; the Towne Scientific School, including architecture and civil, mechanical, chemical and electrical engineering; the Wharton School of Finance and Commerce, also comprising five extension schools in Finance and Accounts, conducted in other Pennsylvania cities, the Graduate School, Law School, the Schools of Medicine, Education, Dentistry, Physical Education, Veterinary School and Hospital, the University Hospital, Wistar Institute of Anatomy, the University Library, University Museum, Astronomical Observatory, Psychological Clinic, and Henry Phipps Institute. The Archæological Museum connected with the University has an especially fine Indian collection, and a collection of Babylonian Tablets second only to that of the British Museum. The value of the grounds and buildings has been estimated at $22,500,000. Several periodicals are published by the Students including *The Pennsylvanian*, a daily and *The Red and Blue*, a monthly.

Pen'ny, an English coin, one twelfth of a shilling in value, first mentioned in the laws of Ina, king of the West Saxons, about the close of the 7th century. It at that time was a silver coin, and weighed 22½ grains, being about 1-240 of the Saxon pound weight. Halfpence and farthings were not coined in England till the time of Edward I, but the penny was indented with a cross-mark, so that it could easily be broken either into two or four parts. The penny steadily declined in weight until the reign of Elizabeth, when it was fixed at 7 23-31 grains or 1-62 of an ounce of silver, a value to which the copper pennies, first introduced in 1797, closely approximated. The present penny is made of bronze, and is of only half the value of the copper penny, for which it has been substituted. The American cent is often called a penny.

Penob'scot, the largest river in Maine. The west branch rises near the Canada line, and flows east and southeast to Medway, where it meets the east branch or Seboois River. Afterward its course is southwest to Penobscot Bay, an inlet of the Atlantic Ocean on the southern coast of the state. The Penobscot is navigable for large vessels to Bangor, 60 miles from its mouth. Its upper waters are used for floating logs from the forests of northern Maine to Bangor and other points, where they are sawed into lumber. The length of the Penobscot is 300 miles, and it is the most important navigable stream in the New England states.

Pensacola, Fla. (*pĕn'sȧ-kō'lȧ*), a port of entry and the county seat of Escambia County, on several steamship lines and three railways. It has a land-locked, deep harbor, defended by two forts. There is also Fort Barrancas, near the site of old Fort San Carlos, connected with the Confederate Fort Redoubt by an underground passage. Pensacola is the home of the Naval Aeronautic School, the submarine flotilla and the torpedo fleet. It has a considerable trade in fish, lumber, coal, cotton, naval stores, grain, etc. Population, 38,000.



Pensacola was settled in 1696 by Spaniards, captured by the French in 1719, restored to Spain in 1723, and passed into the hands of the British in 1763. During the War of 1812, it was captured by General Jackson.

Pen'sions, the regular allowances of money paid to individuals by a government in return for services, civil or military. Most European governments have both a civil and a military list; but in the United States military service alone constitutes a claim for pension. In general, pensions are granted only for active service in time of war and for injuries received during such service. Service-pensions were granted to all survivors of the Revolutionary War by act of 1818, to all survivors of the War of 1812 by act of 1871 to the survivors of the Mexican War by act of 1887 and to Civil War veterans in 1904. But the bulk of United States pensions are invalid-pensions for wounds or disability incurred in service. These extend to the widows and children under 16 years of those who died from such wounds or disease; or, in the event of there being no such surviving widow or children, then to dependent fathers, mothers or minor brothers and sisters of men so dying The pensions, which range from $24 to $2,000 a year, are graded according to the rank of the pensioner and the degree of his disability. Thus, where the regular aid or attendance of others is requires, from $50 to $72 a month is allowed; where the pensioner is incapacitated for manual labor, $30 a month; for the loss of a hand or foot or total deafness, $30 a month; for the loss of both feet or hands or both eyes, $72 a month; and for amputation at the shoulder or hip joint, $45 a month.

In addition to these provisions for injuries incurred in the service, by the law of June 27, 1890, all persons who served 90 days or more in the army or navy of the United States during the Civil War and were honorably discharged and are now suffering from any permanent disease or disability, not the result of vicious habits, which unfits them from earning their support by manual labor, are allowed a pension of from $6 to $12 a month according to the degree of disability. By the same law the widow of any such soldier, without other means of support than her daily labor, shall receive $8 a month during her widowhood, provided she married such soldier prior to June 27, 1890.

An independent bureau for the transaction of the pension business of the government was established in 1833, and in 1849 it was made a bureau of the Department of the Interior. The commissioner of pensions is appointed by the president, and under him about 2,000 persons are employed in the examination and settlement of pension claims; and there is an equal number of surgeons throughout the country whose duty it is to examine all applicants ordered to appear before them.

Pensions, Mother’s. In 1909 President Roosevelt called a conference on the care of dependent children and the Children’s Bureau was established. State laws took up the matter of helping destitute mothers to care for their own children, beleiving this to be better than breaking up the family by sending the children to institutions. Some states give aid only when the father is dead, others include the incapable, criminal or vagabond. The amount paid varies in different states from $6.25 to $15 for one child and from $5 to $15 for each of the others.

Pen’tateuch (*tŭk*) (from the Greek words *pente*, five, and *teuchos*, book), the name given by the Christian fathers to the first five books of the Bible: *Genesis*, *Exodus*, *Leviticus*, *Numbers* and *Deuteronomy*. The Jewish name given to these books was *Torah*, meaning The Law. In connection with *Joshua* these five books are sometimes considered to form one continuous work, by many modern scholars called the *Hexateuch*.

Pe’onage, a system of servitude common in Mexico and some Spanish-American states. By the Spanish colonial system the peon in debt to his employer was bound to labor for him until the debt was paid. It is claimed that under this system employers often contrived to keep their laborers in continual servitude by advancing them money for needless expenditures or selling them goods on credit and at high prices. Peonage in the territory of New Mexico was abolished by act of Congress in 1867. It has also been abolished in the Argentine Republic and some other South American countries

Pe’ony, a shrub, native of southern Europe, northern Africa and Asia. It is a genus (*Pæonia*) of the order of *Ranunculaceæ*. It derives its name from Paion, the physician of the gods, because of its supposed medicinal properties. There are many species, some extensively cultivated in America as ornamental plants and for their flowers, which usually are red or crimson but vary to white. Many varieties and hybrids have been originated. Chinese peonies, which form a large group including many hardy and double-flowered and fragrant varieties, are hybrids obtained by intercrossing various species. There also is a tree-peony, a native of California and Japan. It produces a very large and handsome flower representing a large range of shades and colors. The seeds and roots of certain species of peony are used for food by the wild tribes of Asia.

Peo’ria, Ill., an enterprising city on the Illinois River, 150 miles southwest of Chicago and 180 miles northeast of St. Louis, is an important railway center and is connected by steamboat navigation with the Mississippi River, via the Illinois River. Its charitable and educational institutions include three homes for the poor, four hospitals and other institutions, besides an excellent system of public schools, several parochial schools, Spalding Institute (R. C.), for boys, founded by Bishop John Lancaster Spalding, Sacred Heart Academy (R. C.) for girls, Bradley Polytechnic Institute, founded by Mrs. Lydia Bradley in 1897. The latter institution is endowed with $3,000,000, has 1,200 students and is affiliated with the University of Chicago. Peoria manufactures agricultural implements, automobiles, wire fencing, gates, paper, grain products, alcohol, brick, stoves, soap and other products. It has several beef-packing houses and ranks first in many features of grain traffic. Because of railroad transportation and unlimited coal supply within a mile of the city, also unusually fine water, especially adapted for the purpose, Peoria ranks first in the production of grain alcohol. It has ten distilleries, consuming 100,000 bushels of grain daily. Peoria is per capita the richest city in the United States. Population, 127,000.

Pep’in le Bref (“the short”), son of Charles Martel and father of Charlemagne, was born in 714. Charles Martel, before he died, divided his kingdom between his two sons, Carloman and Pepin, the former taking the German part, the latter Neustria and other portions of northern France; still they were only rulers in the name of the Merovingian king. St. Boniface in 751 crowned Pepin king of the Franks, Childeric, the last king of the Merovingians, having been deposed; and, when Pope Stephen III was hard pressed by the Lombards under Aistulf in 754, he came to France to solicit help from Pepin The latter led his army into Italy, compelled Aistulf to become his vassal, and gave the pope the title of exarch of Ravenna, thus first establishing the temporal sovereignty of the Holy See. He died in 768, and his two sons, Carloman and Charlemagne, divided his territories between them.

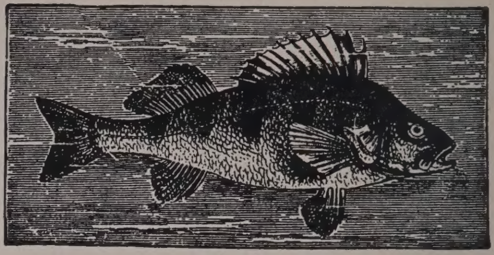
Pep′per, William, an American physician, educator, author and benefactor, was born at Philadelphia, Aug. 21, 1843, and educated at the University of Pennsylvania (*q. v.*), from which he took both his classical and his medical diploma. He was elected provost of the university in 1881; and during his incumbency of 13 years it became a new institution, one of the foremost in the Union. So great was his devotion to the university, that he not only gave his services free but contributed many thousands of dollars out of his own private fortune toward its various endowments. He died on July 28, 1898.

Pep′sin, a substance contained in the gastric juice and the mucous membrane of the stomach, to which the gastric juice largely owes its power of dissolving the contents of the stomach and converting them into chyme. Various plans have been devised for extracting pepsin from the stomachs of calves, pigs and other animals; but it has never yet been obtained in its purity, and its chemical constitution is unknown. Pepsin has been used to a considerable extent in medical practice in cases of weak or disordered digestion; and it is an ingredient in most of the digestive preparations now in the market.

Pepys (*pĕp′ĭs, pēps* or *pĭps*), **Samuel,** a notable English diarist, born in 1683, died in 1703. His famous *Diary* deals with the era of the Restoration, and is replete with minute and curious facts concerning the times in which its author lived. The *Diary* was written in cipher, and was not discovered and published until 1825.

Pequots (*pē′kwŏts*) or **Pe′quods,** a tribe of North American Indians, a branch of the Mohicans, who inhabited the country around Thames River when Connecticut was first settled by the English. It is supposed they branched off from the Hudson River Mohicans at the beginning of the 17th century. They soon conquered most of the tribes in Connecticut, and made treaties with the Dutch and English. But afterwards becoming hostile, an expedition was sent against them from Hartford in 1637. A Pequot fort near the present town of Groton was attacked and fired, and hundreds perished. The war continued until the tribe was nearly annihilated at Fairfield Swamp. The remnant was either sold as slaves or scattered among the neighboring tribes, but a small number were afterward gathered into bands in Ledyard and North Stonington. Even now a few descendants of the Pequods live at Green Bay, Wis.

Perch, a fresh-water fish generally distributed in Europe, the eastern United States and northern Asia. There are about one hundred species. The common yellow perch is the type of those of moderate size. The American form is dark olive-green above, with golden-yellow sides crossed by six or eight dark bars; the lower fins are orange and the upper ones dark green. A few larger fishes, called pike-perches, also belong to the family. The wall-eyed pike is a perch, not a pike. It is one of the most important food-fishes of the lake's region, and is abundant in Saginaw Bay. It attains a length of three feet and a weight of ten to 30 pounds. In contrast with these large perch the family includes a number of darters too small to be of use as food.



PERCH

Percy, a distinguished English family, descended from William de Percy, who accompanied William the Conqueror to England, in 1066 and received large grants of land. See Shakspere's *Henry IV* and *Henry V* for Hotspur or Henry Percy. See, also, Otterburn, Battle of.

Peren′nial Plants, those which live from year to year, either by the persistence of their stems, as in the case of shrubs and trees, or by the persistence of underground parts. The actual duration of such plants is exceedingly variable, the term simply meaning that they do not disappear entirely within one or two years. They may endure a few years or hundreds of years. See Duration.

Perfec′tionists, also called Communists and Free-Lovers, a small American sect founded by John Humphrey Noyes, who was born at Brattleboro, Vt., Sept. 6, 1811. Noyes practiced law a number of years and then became a Congregational preacher. Experiencing a second conversion, he claimed that the prevailing theology is all wrong and separated himself from the Congregational church. He held that the gospel, if accepted, secured entire freedom from sin; that God has a dual being (male and female); that the author of evil is uncreated but is not God; and that communion with Christ saves, not from sinning only, but from disease and death. He and his converts formed a Perfectionist church or community at Putney, Vt., afterward moving to Oneida, N. Y. Men and women put their property into a common stock; they gave up formal prayer, religious service and observance of the Sabbath; those who were married renounced their marriage ties, and a "complex marriage" was established between all the males and all the females of the "family." In 1880 the pressure of outside influence caused the communitiy to change their mode of life in many respects. Marriage and the ordinary family relationship were introduced; communism of property gave place to a joint-stock company organization; and various co-operative institutions were established. Noyes, who assisted in making these changes, died on April 13, 1886.

Perfum'ery or **Per'fumes,** the delicate smells arising from certain odoriferous bodies. Perfumes are of two distinct classes: those derived from plants and those of animal origin. Of vegetable perfumes the most ancient are those gum-resins which exude naturally from trees and plants or from wounds inflicted to increase the yield. Among the most important gum-resins are myrrh, benzoin and camphor. Gum-resins form the chief ingredients in incense and pastilles.

A second group of vegetable perfumes are those procured by *distillation.* These were formerly termed quintessences, but are now called ottos (from Turkish *attar*), the *attar* or otto of the rose. The process of distillation is a simple one. The fragrant part of the plant is put into the still and covered with water. When the water boils, the ottos arise with the steam, from which they are separated by decanting. One hundred pounds of orange or lemon peel will yield about ten ounces of the fragrant oil; 100 of nutmeg 60 to 70 ounces of oil of nutmeg; other substances in various proportions.

But, as many flowers do not yield their essential oil by distillation, two other processes have been devised for obtaining it: *enfleurage* and *maceration.* In the former process square boxes with glass bottoms are provided, upon which is spread a mixture of lard and suet, melted and clarified. Fresh flowers are spread every morning upon this grease, the box being kept closed until the grease absorbs their odor. When the grease has been enflowered, that is, saturated with scent, the process generally lasting three weeks or more, it is again melted and strained into canisters, and then is ready for use. Perfumes are also obtained from flowers by maceration, that is, by placing them in oil or melted fat for several hours and continuing the process with new flowers until the oil or fat becomes fragrant with their odor. The best-perfumed grease is obtained from some flowers by enfleurage and from others by maceration, while others will produce the most satisfactory results by both processes — enfleurage followed by maceration.

Some extent of the industry may be obtained from the average weight of certain flowers grown in the south of France; Orange blossoms, 5,500,000 pounds; roses, 4,400,000 pounds: violets, 330,000 pounds; jasmine, 440.000 pounds; and an equal quantity of cassia and tuberoses.. Europe and British India alone consume about 150,000 gallons of handkerchief perfumes yearly. The English revenue from French *eau de cologne* is $40,000 a year and from other imported perfumes $200,000.

The principal perfumes of animal origin are musk, civet, ambergris and castor, of which musk is most highly prized. The aroma of musk imparts odor to every body or thing with which it comes in contact. Its power to impart odor is so great, that polished steel will become fragrant with it, if they are both placed in a closed box for a sufficient length of time. In the manufacture of perfumery, tincture of musk is mixed with other odorous bodies to render the scent more permanent. See *Rose Industry of Bulgaria,* Piesse's *Art of Perfumery* and Atkinson's *Perfumes and their Preparation.*

Peri (*pē'rĭ*), according to the mystical lore of the east the child of fallen spirits, which spends its life in all imaginable delights but is forever excluded from the joys of paradise. It occupies an intermediate place between angels and demons, and is either male or female. Like the fairies in our own popular mythology the female *peris* possess surpassing grace and beauty. The *houri* is a nymph of the Muslim paradise.

Per'ianth, the general name of the floral leaves of a flower, including both calyx and corolla. It is more especially used in case the calyx and corolla are similar in appearance, as in the lily.

Per'iblem (in plants). At the apex of the stem or root of the higher plants the great regions are first organized in an embryonic form. The embryonic region which organizes the cortex (which see) is the periblem. and it lies just within the dermatogen (*q.v.*), which is the embryonic epidermis.

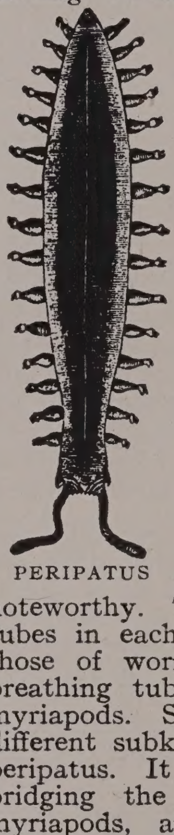
Per'icarp (in plants), a name chiefly used in connection with the fruit of seed-plants (*Spermatophytes*) and applied to the transformed ovary, which invests the seeds as a variously modified outer wall. A pea-pod, exclusive of the peas, is the pericarp. In apples it is the parchment-like investment of the core; while in the peach the pericarp includes both the flesh and the stone, the kernel being the inclosed seed.

Pericles (*pĕr'ĭ-klēz*), the greatest statesman of Greece, was born in the closing years of the 5th century B. C. He received a thorough and extensive education, but of all his teachers the one whom he always held in the highest regard was Anaxagoras, the humane philosopher. Pericles was noted throughout his public career for quiet dignity of manner, grandeur of eloquence, sagacity, honesty and profound patriotism. When he entered public life, although his family did not rank among the highest in wealth or influence, so great was his ability, so noble his character, that he soon rose to the highest power as leader of the popular party. Pericles seems to have clearly grasped and firmly held the modern idea that, as the state is supported by the great body of citizens, its laws should be so framed and administered as to secure the greatest good to the greatest number, rather than to promote the interests of any special class or classes. About 463 B. C. Pericles struck a great blow at the Athenian oligarchy by the introduction of a system whereby the poorer classes could serve on juries and take a more active part in public life. Shortly after this, Cimon, the leader of the oligarchy, was banished. By sheer force of talents and character Pericles became ruler. In 457 B. C. he magnanimously proposed the recall of Cimon, with the agreement between them, it is said, that Cimon should command the army on its expedition abroad and not oppose Pericles in administration at home.

Pericles earnestly sought to unite the Hellenic states in a grand federation, to end their domestic difficulties and make Greece a powerful nation, able to defend itself against all the powers by which it was surrounded. Had the idea of Pericles been carried out, Athens in later years might have proved herself more than a match for Philip and Alexander of Macedon, and possibly might even have resisted Rome. But there already was that smothered hostility between Athens and Sparta that rendered the Peloponnesian War inevitable. Pericles warded off this conflict by diplomacy and bribery; but it came at last in 431 B. C. The plague ravaged Athens next year, and in 429 B. C. Pericles died after a lingering fever. It is well-nigh impossible to relate all that Pericles did to make Athens the most glorious city in the ancient world. Under his patronage Greek architecture and sculpture reached their highest development. To him Athens owed the Parthenon, the Odeum and the Propylæum, that most stupendous of all architectural constructions of Greece. He also encouraged music and the drama; and during his rule industry and commerce were in so flourishing a condition that there was universal prosperity in Attica. Although he had many enemies who denounced him for the expenditure of so much public money upon buildings and amusements, the truthful pen of Thucydides records that he did not act unworthily of his high position, that he never oppressed or persecuted his adversaries and that, although he had unlimited command of the public purse, he personally was above corruption. Plutarch records that, when Pericles lay dying and the friends around his bed were reviewing the grand achievements of his life, he quietly interrupted them by saying: "What you praise in my life belongs partly to good fortune, and at best is common to me with many others; but the thing of which I am proudest is that no Athenian has ever put on mourning on account of me."

Perigynous (*pē̇-rĭj′ĭ-nŭs*) **Flowers,** those in which the sepals, petals and stamens are borne on the rim of a cup-like body which rises around the pistil or pistils, as in certain members of the rose family. The noun form is perigyny, and the contrasting terms are hypogyny, in which the other floral parts arise from beneath the ovary, and epigyny, in which they seem to arise from the summit of the ovary.

Perip′atus, an interesting animal connecting worms and insects. About 20 species are known, inhabiting South Africa, Australia, New Zealand, South America and the West Indies. They have a long body like a worm or caterpillar, but the segments or joints do not show on the outside. Internally, however, they are well-marked. There is no division into thorax and abdomen. The head bears antennæ and jaws. The body is provided with short, jointed feet (14 to 42 pairs), like a thousand-legged worm. Like the myriapods, they are found under stones and in rotting wood, and feed on insects and the like. Their internal structure is noteworthy. They possess a pair of looped tubes in each segment of the body, like those of worms, and, in addition, have breathing tubes like those of insects and myriapods. Structural peculiarities of two different subkingdoms of animals unite in peripatus. It is a sort of generalized form bridging the gap between worms and myriapods, and the myriapods connect with the lowest insects. Peripatus is of much interest to zoologists as a survivor of a very ancient family of animals and as a link between the worms and arthropods.


PERIPATUS

Per′isperm, the nutritive tissue which occurs in seeds outside of the embryo-sac. Within the embryo-sac the nutritive tissue is called endosperm. Perisperm is derived from the nucellus of the ovule, while endosperm is a part of the female gametophyte. In most seeds perisperm does not exist, all the nutritive tissue being endosperm.

Per′istome (in plants), the set of tooth-like processes found at the open mouth of the capsules of mosses. They arise from the rim and extend radially toward the center, and are of various and often beautiful patterns.

See Mosses; Musci.

Perkin, Sir William Henry, an eminent English chemist, was born in London in 1838. He was educated at the City of London School and for a time studied chemistry under Dr. A. W. Hoffman at the Royal College of Chemistry. In 1856, while pursuing his own researches, he was led to discover aniline purple or mauve, a discovery which founded the industry of the coal-tar colors. His name is also associated with other important discoveries, for which he was signally honored. Among the medals he held was one awarded by the American Chemical Society, on the occasion of his visit to the United States in 1906. The influence of the great chemist's discovery on the coal-tar industry has been great, for to-day no less than 700 coloring matters are derived from coal-tar products. He also received the Hoffmann Medal from the *Deutsche Chemische Gesellschaft,* and the Lavoisier Medal from the *Société Chimique de Paris.* He was awarded the Davy Medal from the Royal Society. From 1883-85 he was president of the Chemical Society. He was knighted in 1906. He died on July 14, 1907. The Perkin Memorial Fund, which is devoted to chemical research, and the Perkin Medal for American chemists, were created shortly after his death.

Perkins, Frances, a distinguished sociologist and the first woman in the United States to hold an office in the Cabinet, was born in Boston, Massachusetts, on April 10, 1882. The charming and capable daughter of Frederick and Columbia University. was educated at the University of Pennsylvania, Mt. Holyoke College, and Columbia University. After receiving her A.B. degree from Mt. Holyoke in 1902, she engaged in teaching at Lake Forest College, a co-educational institution situated near Chicago. It was during this period of her life that the foundations for her future valuable services to labor and the nation were laid. She was deeply impressed by the theories advanced by Bernard Shaw, Jacob Riis and Vida Scudder on environment and the individual, and equally affected by her visits to the several Chicago settlement houses. After the close of the school term she devoted herself to six months' of settlement teaching at the famous Hull House in Chicago. It was here that she became acquainted with Jane Addams. Her work in Chicago was followed by further study in economics and sociology. In 1910 she received her M.A. degree from Columbia University.

Frances Perkins
Sec'y of Labor

From 1910-12 Miss Perkins was secretary of the Consumer's League of New York. In 1911 she became a lecturer in sociology at Adelphi College. It was in this same year, soon after the disastrous Triangle Waist Factory fire in New York City, in which 146 girls lost their lives, that Frances Perkins was appointed to serve on a committee to inspect fire hazards and to foster the enactment of such laws that would prevent the recurrence of a similar disaster and provide better working conditions. The result of the committee's work and the efforts of Franklin D. Roosevelt, Alfred E. Smith and Robert Wagner, who at that time were Assemblymen, was the establishment of a State Factory Investigation Commission. The Factory Inspector of this commission was Miss Perkins. From 1912-17 she served as Executive-Secretary of the Commission on Safety of New York. From 1919-21 she was Commissioner of the New York State Industrial Commission. In 1921 she became Director of the Council on Immigrant Education, a position she held until 1923 when Gov. Alfred E. Smith appointed her to serve on the State Industrial Board of New York. When Franklin D. Roosevelt became Governor of the state of New York in 1929, she was appointed head of this Board. Her tireless work to create better working conditions for the people of New York was ever guided by a "profound sense of justice and fair play." Frances Perkins became known as the "political exponent of technical truth." She strongly advocated workmen's compensation, old age pension and unemployment insurance. It was Frances Perkins who first proposed the fifty-four hour working week for women.

When the Roosevelt Administration became a reality in March, 1933, President Roosevelt invited Miss Perkins to become a member of his Cabinet in the capacity of Secretary of Labor, the first woman in America to be so honored. Her keen perception and ability soon came into play. Early in March, 1933, the Hoover-Doak Immigration Bureau, an organization the members of which investigated violations of labor laws, was abolished. On March 23, she appeared before Congress to stoutly defend the Conservation Corps bill, a plan endorsed by President Roosevelt, "to enlist 250,000 unemployed in conservation corps to work on reforestation and similar projects." As Secretary of Labor Frances Perkins is putting forth every effort to raise the standards of society. She strenuously endorses shorter working hours, a higher wage scale, and an "intensification of factory and workmen's compensation laws."

The ability and charm of Miss Perkins are not confined within the limits of her public life. In private life she is Mrs. Paul Wilson and the devoted mother of a seventeen year old daughter, Suzanne, a rôle which she so thoroughly enjoys and of which the public knows so little. She is most reticent about her private life, a trait which she has inherited from her fine New England ancestry. Miss Perkins has found time throughout her busy life to engage in literary work. Her most important publications include: *Life Hazards from Fire in New York Factories* (1912); *The Problem of Mercantile Fire Hazards* (1914); *A Plan of Maternity Care* (1918); *Women and Employers* (1919); *A Social Experiment under the Workmen's Compensation Jurisdiction* (1921).

The aptitude and magnetic charm of this public official, devoted wife and mother, and stirring author have made Miss Perkins one of the most prominent figures in the life of the American nation today, a woman whose capabilities are clearly recognized.

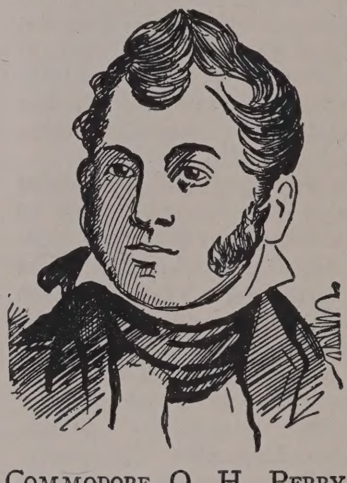
Pernambuco (*pĕr-näm-bōō'kō*), a State of northeastern Brazil. It extends over an area of 49,560 square miles, and is fertile and thickly populated on the coast, although somewhat barren and mountainous inland. Pernambuco produces great quantities of sugar and a good deal of coffee, cotton, tobacco and maize, Carnauba wax and rubber. Cattle and horses are raised on the plateaus of the interior. Pernambuco has a population of 2,869,814.

The capital of the State is Pernambuco or Recife, a town of 340,543 people. This is an important trading-port of northern Brazil owing to its nearness to Europe, in spite of the fact that the harbor is not navigable by the largest vessels. Pernambuco ranks third among the cities of Brazil. The city was founded by the Spaniards in the latter half of the sixteenth century.

Perpetual Motion, stated in modern terms, is a name given to the problem of creating energy. Lavoisier proved the impossibility of creating or annihilating even the most minute portion of *matter*. In like manner all modern physical investigations have shown the impossibility of creating or annihilating *energy*. Since no mechanism is known which does not absorb some energy in friction, it is evident that if we are to keep any mechanism in motion we must constantly supply it with energy. This great generalization may be said to date from 1847, when Helmholtz published his great memoir on the *Conservation of Energy*. But long before that time it was well-known to clear thinkers that the law of the conservation of energy applies to all purely mechanical operations. Accordingly in 1775 the French Academy declared that it would not thereafter receive any communications upon the subject of perpetual motion. This latter date may, therefore, be considered as marking the complete overthrow of the idea that motion can be secured in any actual mechanical device without a constant supply of energy. The year 1847 may be considered as marking the overthrow of the idea that perpetual motion can be secured by any means whatever, whether it be mechanical, electrical, thermal or other. See DYNAMICS; ENERGY.

Perrault (*pĕ-rō'*), **Charles,** a noted French critic and author, was born at Paris, on January 12, 1628, the youngest of an advocate's four sons. He was sent at nine years of age to the College of Beauvois. There he quarrelled with his teachers, and the rest of his education was left to himself. He studied law and was admitted to practice, but soon tiring of the routine of the legal profession, he procured an easy post under his brother, the receiver-general of Paris. Perrault's name has been made immortal by eighteen fairy-tales, published in 1697. Among his "Mother Goose" stories are: *The Sleeping Beauty; Little Red Riding-Hood; Bluebeard; Puss in Boots; The Fairy; Cinderella; Hop o' My Thumb* and others dear to childhood. Perrault died at Paris, on May 16, 1703.

Perrin (*pĕ-răn'*), **Jean,** a noted French physicist, was born at Lille in 1870. In 1926 he was awarded the Nobel Prize for Physics. Among his most important writings are the *Brownian Movement and Molecular Reality,* which was translated into English and published in London in 1910; and *Les Atomes,* which has been translated into both English and German.


COMMODORE O. H. PERRY

Perry, Oliver Hazard, an American naval officer was born at South Kingston, Rhode Island, on August 23, 1785. He entered the United States Navy in 1809, and at the beginning of the War of 1812 was transferred at his own request from the command of a division of gunboats on the Atlantic coast to serve under Commodore Chauncey on Lakes Erie and Ontario. He participated in the attack upon Fort George at the head of a body of seamen, but his fame rests upon the victory he won over the British squadron on Lake Erie, near Put-in-Bay, Ohio, on September 10, 1813. In this action, known as Perry's Victory, the Americans were completely victorious, the result being fitly told in Perry's dispatch to the government: "We have met the enemy, and they are ours." He was rewarded with the rank of captain and a vote of thanks by Congress. He continued in the naval service throughout this war and for several years thereafter until his death. Perry contracted yellow fever while cruising in the West Indies and died at Port Spain, on the island of Trinidad, on August 22, 1819.

Persepolis (*pĕr-sĕp'ō-lĭs*), (Persia City), the Greek name for the capital of ancient Persia, the Persian name having been lost. This city was situated in a beautiful plain near the junction of the Araxes (Bondomir) and the Medus (Polwar) River. Nothing remains of the city at the present day except its magnificent ruins. It was generally designated The Glory of the East, and, according to ancient writers, "no other city could be compared with it either in beauty or in wealth." It was nearly or wholly destroyed by Alexander the Great in his conquest of Persia, and is scarcely mentioned in history afterward.

Perseus (*per'sē-ŭs*), the Greek myth hero who slew the Medusa (*q. v.*) and set free the beautiful Andromeda (*q. v.*) who had been fastened to a rock and left as prey to a sea monster. The Medusa had hair made of snakes, a bad disposition and a third interest in an evil eye which turned all who looked upon it into stone. Perseus cut off her head but the beautiful Andromeda he married; "and they lived happily ever after."

Pershing, General John Joseph, Although Foch's assignment of Pershing to Alsace-Lorraine where the American troops first fought under the general's command and with such brilliant success was, of course, dictated by purely military reasons, there is something suggestive of the romantic days of knighthood in the fact that General Pershing is of Alsatian descent, although he is a native of Missouri where he was born on a farm in Linn County, September 13, 1860.

And no knight of the days of chivalry ever had a knightlier presence. Six feet in height, broad shouldered, straight as an arrow, clear eyed and direct, he looks every inch the soldier and the man. Few men, even in the military nations of Europe, have had so varied a military experience. Graduating from West Point in 1886, he at once began active service in the Southwest. In the Philippines he helped to subdue the savage Moros. On the Mexican border as successor to General Funston, he commanded the largest body of troops that had been assembled since the disbanding of the army of the Civil War, and on Mexican soil as well as in the Philippines, he demonstrated the resourcefulness under hard conditions which he had previously learned in the Apache Indian campaign in Mexico and Arizona in 1886 and the campaign against the Sioux Indians in 1891 and 1895.

Following the Spanish War, he organized the Bureau of Insular Affairs and was its chief until August 16, 1899. He had an opportunity to study modern warfare on the great scale as military observer with Kuroki's army during the Russo-Japanese War. He served on the general staff from 1903 to 1906. Like Foch he has been an instructor in military art, (incidentally he is a trained teacher, for he took his A.B. degree at the state normal school at Kirksville, Mo.). He was military instructor at the University of Nebraska from 1891–95, and later at the same time took a full course in law. Later he was for two years instructor in tactics at West Point.

Pershing first became a national figure in 1905, when President Roosevelt promoted him over the heads of 862 senior officers and made him a brigadier general. In 1909 Pershing returned to the Philippines as governor of Moro province, remaining there until he was called to the Mexican border in 1914. While he was serving on the border his wife and three daughters were burned to death in a fire at the Presidio, San Francisco; only his son Warren was saved. Finally came the call to France. It was a historic moment when Pershing arrived at Boulogne, June 13, 1917; for the first time an American commander was to lead American troops on European soil. On him rested the burden of organizing the A.E.F. Though his final test as a commander in operations was short, the achievements of the A.E.F. place him high among the leaders in the war.

Persia (*pĕr'shȧ*), the most extensive and powerful native kingdom of western Asia, consists for the most part of an elevated plateau, which in the center and on the east is almost a dead level, but on the nothwest and south is covered with mountain chains. It may be said to possess three climates: that of the gulf-coast, that of the elevated plateau and that of the Caspian provinces. Along the southern coast the heat of summer and autumn is severe, while in winter and spring the climate is delightful. On the plateau there are considerable differences of climate and considerable variation from heat to cold. About Ispahan the winters and summers are equally mild; but to the north and northwest of this the winters are severe; and the desert region of the center and east and the country on its border endure oppressive heat in summer and piercing cold in winter. Except in the Caspian provinces the atmosphere is remarkable for dryness and purity. The cultivated portions, when supplied with moisture, either by rainfall or irrigation, are very fertile. In some places two crops can be raised in the year. The principal products are wheat (the best in the world), barley, corn, sugar and rice. The vine flourishes in several provinces, and the wines of Shiraz are celebrated in eastern poetry. Opium and tobacco are among the considerable exports, together with wool, silk, cotton and the fine, Persian, hand-made carpets. Pearl-fishing and the mining of turquoises and precious stones are important industries.

Most Persians are Mohammedans, except the Sunnis and the Parsis (*q. v.*), who retain the ancient faith of Zoroaster.

The government is a constitutional monarchy with an elective national council and senate. The revenue is derived almost exclusively from a tax on the land and its products, and as a natural result the peasantry are seriously oppressed by the provincial governors. In 1905 the people demanded representative institutions and the shah consented to the establishment of a national council, but later was deposed and his son succeeded to the throne. At the beginning of the World War (*q. v.*) the Government was largely under the control of Russia, with a distinct

British sphere of influence but one of the results of the War and the Russian Revolution was that Great Britain became the dominant factor in Persian affairs.

The chief cities are Teheran, the capital, population 280,000; Tabriz (200,000) and Ispahan (70,000). Of the total population, estimated at 9,500,000, fully two-thirds of the population belong, like ourselves, to the Aryan race but as a result of repeated invasions of the Mongols, this race is strongly represented in certain Provinces; in Kharasan, for example, where the natives show their Mongol blood by their broad, flat faces, high cheek bones and slanting eyes. In the region along the Persian Gulf dwell the Arab tribes and, true to tradition, they are constantly folding their tents and wandering away with their cattle to new pastures. In the spring and summer they go into the hills, but in winter descend to the warmer plains. The Arab women of these regions are not veiled like the women of the towns and villages. They are much given to jewelry and their outdoor life is reflected in their good health and happy disposition. The Persians proper are a vivacious, witty and artistic race and strongly suggest the French.

The wild and undeveloped provinces along the seaboard are the favorite haunts of the native animals—the leopard, the hyena, the tiger, the cheetah, the jackall, the lynx, the porcupine, the wild ass and the wild goat. *Monarchies.*

Per'sian Gulf, an arm of the Indian Ocean, lying between Arabia and Persia. Its length is 600 miles, its breadth varying from 50 to 250 miles. The total area is about 75,000 square miles. The order of its periodic currents is precisely the reverse of those of the Red Sea, as they ascend from May to October and descend from October to May. The greatest depth does not exceed 50 fathoms. Oriental geographers give this gulf the name of the Green Sea, from the strip of water of a greenish color lying along the Arabian coast.

Persim'mon or **Date-Plum,** a tree from 30 to 60 feet in height, which yields a fruit about the size of a plum, with six to eight oval seeds. The color of the fruit when ripe is orange-red or reddish-brown. It is very astringent until over-ripe and mellowed by frost, when it has a sweet and agreeable taste. It is a native of the southern portions of North America, where one tree often yields several bushels of fruit. While distinctively a southern tree, it grows as far north as Long Island and as far west as Illinois. In the lower Atlantic and Gulf states the tree is very common, and is there found at its best. Where it has space it is a wide-spreading tree. The leaves are long, thick, smooth and lustrous, dark green above but lighter below. The bark is very dark; the almost black wood is close grained and hard, and is used for shoelasts and shutters.

Perth Am'boy, N. J., a city and port of entry in Middlesex County, situated at the mouth of Raritan River, where it falls into Raritan Bay, at the foot of Staten Island Sound, 20 miles south of New York City. It is reached from the latter by a number of railroads, chiefly the Central of New Jersey, the Pennsylvania and the Lehigh Valley. Deposits of kaolin and fire-clay are found in the city, and give employment to terra-cotta, drain-tile and fire and glazed-brick works etc. There also are machine-shops, iron foundries, cigar factories, chemical and cork works, oil-refineries, lead and cement works, ship-yards and two silver and copper refineries, one of which ranks as the largest in the world. The Lehigh Valley Railroad has large coal and freight wharves abutting on the fine harbor. Three other roads run into Perth Amboy. There are good schools, churches, banks and other civic equipments. Population, 44,000.

Perth, a city of Scotland, on the right bank of the Tay, 43 miles from Edinburgh and 62 from Glasgow. The great beauty of its surroundings — the noble river, the two wooded heights, Moncrieff and Kinnoul Hills, each 700 feet high, and away to the north the Grampians — makes The Fair City well-worthy the name. A handsome bridge of nine arches connects the city with the suburb of Bridgend, where Ruskin spent a portion of his childhood. Along the Tay extend two beautiful public parks, each containing nearly 100 acres. Population 35,851.

Peru', a republic of South America, is bounded on the north by Ecuador, on the east by Brazil and Bolivia, on the south by Chile and the Pacific Ocean and on the west by the Pacific. Its area is not definitely known, but is estimated at about 695,733 square miles. The population, not including wild Indians, according to the latest census was 4,609,999 the aboriginal Inca Indians constituting more than half of this number. The Peruvian government considers the total population as under 6,000,000.

Surface. The length of Peru along the Pacific is nearly 1,500 miles or, measured on the coast of the United States, as far as from Massachusetts to the southern point of Florida; its breadth at its northern boundary is between 700 and 800 miles, but at the southern one is less than 100 miles. The surface is divided into three distinct tracts, the climate of which varies from torrid heat to arctic cold, while their products range from the stunted herbage of the mountain slopes to the rich fruits of the tropical valleys. These three separate regions are the Coast, the Sierra and the Montaña. The coast is a strip 30 to 60 miles in width, extending from the Pacific to the western Cordillera. For the most part it is a sandy desert; but it contains many fertile valleys watered by streams which have their sources on the mountain slopes. Between these valleys are trackless deserts, covered with a shifting, yellow sand, which is often carried about by the wind in pillars 100 feet high. In this coastal region rain is unknown. This is due to the fact that the southeast trade-winds of the Atlantic, cooled by the eastern slopes of the Andes, lose much of their moisture in the excessive rainfalls of that region and the further fact that the remainder is exhausted in covering the Cordilleras with snow, after which the winds fall cool and dry upon the western coast. The sierra embraces all the region between the eastern and western Cordilleras and the two ranges of the Andes. This region averages 100 miles in width and is estimated to contain an area of 150,000 to 200,000 square miles. After the table lands of Tibet those of Peru and Bolivia are the highest in the world. Unlike those of Tibet, which are mere grassy uplands, they are studded with towns and villages; and even at this elevation the climate is pleasant and wheat, corn, barley, rye and potatoes are produced. The montaña region extends eastward from the Andes to Brazil and Bolivia. It embraces more than half the area of Peru, and consists of vast forests and alluvial plains, is rich in all the productions of tropical latitudes, and teems with vegetable and animal life. The mountain system is divided into three ranges: the western Cordilleras, the central Cordilleras and the Andes. In the western Cordilleras are found the peaks of Huascar 22,000 feet; Huandoy 21,088 feet; Hualcan 19,945 feet; Sara-Sara 20,000 feet, Chachain 19,820 feet; and Misti 20,260 feet. The central Cordilleras form the divide between the waters which flow to the Pacific and those which flow to the Atlantic Ocean. Between this range and the Andes on the east lies the great Peruvian plateau.

Rivers and Railways. The three great rivers of Peru are the Marañón, Huallaga and Ucayala. The Marañón has its source in Lake Laurichoca on the eastern slope of the central Cordillera at an altitude of 14,270 feet. It flows toward the northwest until near the boundary of Peru and Ecuador, where it turns eastward. The Huallaga has a parallel course on the western side of the Andes until it breaks through that range and joins the Marañón. The Ucayali is on the eastern side of the Andes, flowing north parallel with that range for 1,200 miles, when it unites with the Marañón to form the Amazon. The Amazon flows 270 miles in Peru, before it passes into Brazil. These three rivers have numerous branches, some of them of considerable size. The Ucayali is navigable to Mayso, 3,623 miles from the mouth of the Amazon. Numerous rivers flow into the Pacific, but none is navigable. Several streams flow into Lake Titicaca. This lake, which extends into Bolivia, is 155 miles long and the largest in South America. Peru has but 1,200 miles of railways. The most important line runs from the port of Callao to Lima, thence across the Rimac Valley and over the mountains to Oroya, crossing through a tunnel 15,665 feet above the sea. Another line extends from Molenda on the coast, 324 miles to Lake Titicaca. The railway from Oroya to Cerro de Pasco is open. That between Guaqui and La Paz has been completed. Roads between Oroya and Huancayo and between Sicuani and Cuzco are building. The railways in operation extend 1,200 miles; the telegraphs 3,740 miles. Other short lines extend from coast towns into the interior. Between Cuzco and Sicuani there is a carriage-road on which steam-traction is used.

Cities. The chief cities are Lima, the capital, nine miles inland from the port of Callao, population 140,884; Callao, the principal port on the Bay of Callao (31,000); Arequipa (35,000); Cuzco (10,000); Ayacucho (14,346); Chinca Alta (18,000); Piura (15,000); Janca (15,000); Cerro de Pasco (14,000); and Chiclayo (14,000).

Resources. The mountainous regions abound in gold, silver, copper, lead, iron and other minerals, and there are rich placer deposits along certain rivers. The river valleys are very fertile, producing sugar, cotton, coffee and other products. The plateaus afford vast tracts of rich pasturage, while the vast forests in the east are rich in rubber trees and a variety of valuable woods. But the development of the rich resources has been long delayed through lack of transportation facilities. In the eastern or forest section there are navigable rivers; and a few railway lines reach short distances inland from the coast; but the great plateaus, the agriculture lands and the mountainous regions, rich in minerals, have not even wagon-roads but only bridle-paths. It takes one day by rail, nine on mule-back and seven on steamboat, 17 days in all, to go from Lima, the capital, to Iquitos near the head of the Amazon, a distance of 1,224 miles, or less than the distance from New York to Omaha.

Government. Peru is a republic, divided into one constitutional province, two littoral provinces and 18 departments. The president is elected for four years and is not eligible for a second consecutive term. There are two vice-presidents, and a Congress consisting of a senate and a chamber of deputies. The president, vice-president, senators and deputies are elected by direct vote of the electors. There are a supreme court, nine superior courts and inferior courts, called "courts of first instance."

The manufacturing interests are not large. There are cotton and woolen mills, tobacco and cigar factories, rice and sugar mills and numerous small factories of various kinds.

History. Peru was under the dominion of Spain from its conquest by Pizarro in the sixteenth century until 1821, when it was proclaimed an independent republic under the protectorate of General San Martin, one of the liberators of Chile. San Martin retired on the arrival of Gen. Simon Bolivar in 1823, and next year occurred the battle of Ayacucho, in which the Spanish Viceroy was taken prisoner and Spanish domination finally ended. Bolivar left Peru two years later, but it was not until 1844 that the government was fully settled under the Presidency of Ramon Castilla. In 1879 Peru, as the ally of Bolivia, became involved in a war with Chile, the latter state coveting the nitrate deposits in the Peruvian province of Tarapacá. This war was disastrous to Peru both on land and sea, the provinces of Tacna and Tarapacá being wrested from her, and in 1881 the Chilean army entered the capital. Peace was concluded in October, 1883, and some months afterward the Chileans evacuated the country. Under the Presidency of General Cáceres and his successors, Peru has made slow but certain progress in repairing the wastes and losses that she suffered during her conflict with Chile. From 1914-29 negotiations were under way to establish peaceful relations between Peru and Chile. It was during this period that the Tacna-Arica dispute between the two countries was peaceably settled. Secretary of State, Frank B. Kellogg of the United States played an important rôle in this settlement and the resuming of diplomatic relations between Peru and Chile in 1929. The following year the Provisional Government under the Provisional President, Col. Sánchez Cerro, was confronted with serious internal dissention as well as economic difficulties. Col. Cerro succeeded to the Presidency following a revolt at Arequipa on August 22, 1930, against the eleven year régime of President Leguía. The Provisional Government issued a decree in November of that year ordering a general election to choose a National Assembly, which was to meet at Lima in May, 1931, to frame a new Constitution for the Republic. Col. Cerro was forced to resign from office in March, 1931, following a revolt. He was succeeded in the office by Ricardo Leoncio Elias. Two Provisional Presidents later succeeded Elias, Colonel Gustavo Firmenez and David Sumanez Ocampo.

It was in January, 1934, that the Republic of Peru found it necessary to cope with a military plot against the government, a revolutionary strike in Lima, and general riots. Several arrests were made following these outbreaks. The Government ordered the arrests of both soldiers and civilians, a number of whom were either Communists or members of the Aprista party, who had participated in the revolutionary outbreaks. By the first of February the Government had the situation well under control.

The Government of Peru has long been seeka solution to its external public debt problem. The Government's aim has been a revision of the debt, which amounts to about $88,104,440, and cooperation by means of lower tariffs and quotas to accomplish this revision. President Benavides stressed the importance of this aim in his interview with Secretary of State Cordell Hull of the United States in January. In accordance with the embargoes of 1932, copper, sugar, cotton and petroleum from Peru have been excluded from the United States. "Cooperation through tariffs" is essential to the development of a new trade pact with the United States. A national economic advisory council, composed of representatives from the chambers of commerce, trade associations, banks, industry, and liberal professions, has been established by the government to consider the problem of public debts and credit and to establish economic democracy.

A commercial treaty was consummated between Peru and Chile on March 17, which will greatly stimulate trade between the two republics. The contents of the treaty have not as yet been disclosed, but it was revealed that the pact liquidates "pending obligations derived from the Lima Treaty of June, 1929, which concluded the Tacna-Arica dispute.

March 23 marked the beginning of a four month period of festivities throughout the Republic of Peru in celebration of the four hundredth anniversary of the founding of the golden city of Cuzco. The Spanish foundation of Cuzco was established by Pizarro on March 23, 1534. As a tribute to Pizarro and to the Incas, whose civilization spread over this country, the Peruvian Congress voted vast sums of money to defray the expenses of the celebration and to construct new roads, public works, and monuments. The Incas developed a remarkable system of irrigation, many features of which, such as canals, aqueducts, and dams, will be restored by the Government of Peru. Throngs of visitors have already begun to pour into the republic to visit the ruins of the civilization of the Incas, their palaces and temples and to participate in the festivities. An archæological expedition from the National Archæological Museum, under the leadership of Dr. Luis Valcarcel, has arrived in Peru to begin work among the ruins of Saxahuaman fortress. This region has been a vast source of treasure to archæologists. In 1933, at the International Congress at La Plata, the city of Cuzco was proclaimed the "archæological capital of South America."

Peru (*pē-rōō'*), a city and the seat of Miami County, Indiana, is situated at the confluence of the Mississinewa and Wabash Rivers, sixteen miles east of Logansport and seventy-one miles north of Indianapolis. It is served by three railroads, three traction lines, a commercial airport and motor buses. Peru, situated in an agricultural section, is a trading point for a large area, and is an important distributing center.

It is largely a residential town, with the business section located on two streets, Broadway and Main, intersecting each other at right angles. There are few apartments, Peru being a city of home-owners. The factory district lies on the outskirts of the town. The city owns and controls the water-works. It is the home and winter quarters of the American Circus Corporation, which lodges five complete circuses on grounds extending over almost 1,000 acres of land. A summer zoo is a permanent feature. The principal industries include steam tractors, furniture, radios, refrigerators, electric goods, hardwood lumber, heating appliances, clothing, iron and brass products, stationery and plumbers' supplies. Peru was founded in 1827 and incorporated in 1848. In 1930 the population was 12,730 of which 94.8 per cent were native whites, and ninety-nine per cent English reading.

Perugia (*pā-rōō'jä*), a city and the capital of Perugia province in Italy, is situated on the right bank of the Tiber, eleven miles east of the Lake of Perugia and 125 miles north of Rome. It is enclosed in walls pierced by many gates, of which the Etruscan arch of Augustus is the finest. In the vicinity are several Etruscan tombs which were discovered in 1840, and contained cinerary urns, lamps, vases, armor, ornaments and various pieces of bronze. Among the outstanding buildings of the city are the Gothic Cathedral of San Lorenzo, which dates from the latter fifteenth century; the Church of St. Dominic, erected in 1632, and the wonderful eleventh-century Church of St. Peter. Perugia is the seat of a University, which was founded in 1308 by Pope Clement V. It is noted for its botanical garden, observatory, library and valuable antiquarian museum. The enrollment is less than 350. The manufactures of the city include silks and woolens, wax candles and liqueurs. Perugia was the ancient Perusia, one of the twelve Etrurian republican cities. It was captured by the Romans in 310 B. C. and recaptured in 40 B. C. Totila captured it, and Norses recaptured the city in 552 A. D. In 1512, it was incorporated with the Papal States, and annexed to the Kingdom of Italy in 1860. It gained lasting fame as the center of the Umbrian school of painting in the fifteenth century. The population in 1931 was 79,270.

Perugino (*pā-rōō-jē'nō*), a celebrated Italian painter, the head of the Umbrian school, whose real name was Pietro Vannucci, was born near Perugia in 1446. He studied painting in Florence in a class with Leonardo da Vinci. He became a teacher of Raphael. He established himself in Perugia, and took the name of that city. Perugino painted in Florence, Venice and Cremona. He went to Rome in 1483 and was employed by Sixtus IV in decorating the Sistine Chapel. Some of his frescoes were destroyed to make way for Michael Angelo's *Last Judgment*, but *Christ Giving the Keys to Peter* remains, and is the best of those still visible. In 1499 he painted in Perugia the lovely frescoes in the Sala del Cambio. After 1502 he worked much of the time in Florence. He was among the first of the Italians to use oils, and ranks as a purist. He was supreme in technique among the artists of religious subjects. An architectural sense of design, the use of pure rich color, aerial perspective and a sense of space in his landscapes characterized his work. He was painting frescoes in Castello di Fontignano in 1524, when he was stricken with the plague and died. The National Gallery of London has some of his most famed paintings, including the exquisite *Virgin; Michael; Raphael,* and *Child.*

Pessimism (*pĕs'ĭ-mĭz'm*), the doctrine that the world is bad rather than good. It may mean either (1) an attitude toward life in which men despair of attaining happiness, or consider that life cannot grant real happiness; or (2) an attitude determined by reasoning along the lines of metaphysics and psychology, by means of which a philosophical doctrine of pessimism is reached. Pessimism is an attitude toward life that has existed since ancient times. Religions which hold high the idea of redemption, usually result in a pessimistic attitude toward the present imperfect life as a counterpart to the hope of a perfect future. The world falls so far inferior to the ideals of the soul that happiness is impossible. The most extreme religious pessimism is found in the Buddhistic doctrine that human life is essentially one of suffering from which relief comes only through such self-discipline as gradually destroys all yearning for the satisfactions of life, and ends at last in Nirvana, the peace of utter extinction.

Pessimism, however, may be only a result of the lack of any high ideal or purposeful aim to give life a real value. The philosophical theory of pessimism is comparatively recent, and dates chiefly to doctrines of Schopenhauer and Hartmann. Schopenhauer conceived the world as a blind will of restless striving by which only misery could be obtained; man's hope lay in the negation of that will, achieved through contemplation of intellectual beauty and truth. As a practical attitude toward life, pessimism is only open to refutation. It cannot long maintain itself as a widely-diffused attitude toward life; human life and institutions cannot continue to exist unless men see good in them and desire them to continue more strongly than they desire them to end. Pessimism is supportable only as an individual and personal attitude, and not as a philosophical principle for the world at large.

Pestalozzi (*pĕs'tȧ-lŏt'sė*), **Johann Heinrich**, a Swiss educational reformer and founder of modern pedagogy, was born at Zürich on January 12, 1746. He was the son of a skilled optician and the grandson of a village parson. Eager to be an adjuster of social wrongs from his youth, he sought to realize his aims through the education of the young, and to him belongs the high honor of conceiving a method which is the corner-stone of all sound theories of education, especially of primary education. Although he was illiterate, ill-dressed, a poor speaker and a poor manager, and although all his undertakings resulted in practical failure, he aroused the admiration of Europe and called forth a host of disciples, who to the present day have carried out the principles of their master with the greatest enthusiasm. Pestalozzi was totally unable to cope with the world, but he awoke the minds of men to a sense of their responsibility to childhood and ushered in the nineteenth century as the educational age *par excellence.* He first sought to carry out his theories by collecting a number of orphans and outcast children upon a farm in Aargau to educate them by blending industrial, mental and moral training; but on account of faulty domestic economy this enterprise failed and was abandoned after five years' struggle. Soon after this he published *Evening Hours of a Hermit.* In this work he developed the following principles as the basis of education: (1) In educating man seek first of all to *know* him. (2) The method whereby to educate anyone should be founded upon his own nature. (3) In his nature are hidden the forces that will draw out his faculties; therefore exercise them. (4) It is exercise that connects the wants of our nature with the objects that satisfy those wants; everyone's education should answer to his own needs and the inner call of the soul. In later years Pestalozzi published *How Gertrude Educates Her Children,* the recognized exposition of Pestalozzian method. It sets forth that the education and development of human nature should be in harmony with natural laws; that in order to teach well we should study the processes of nature in man and its particular processes in individuals; and that *observation,* a spontaneous perception of things, is the method by which all objects of knowledge are brought home to us. This affirmation contains the essence of the whole theory of institutional education. In 1805 Pestalozzi moved his school from Berthond to Yverdon (Ifferten), which drew upon him the eyes of all Europe; but the same incapacity in practical affairs that had caused the failure of all his other schemes showed itself here, and in 1825 this school was closed, and Pestalozzi withdrew to Brugg, where he lived, an object of mingled pity and respect, until his death on February 17, 1827.

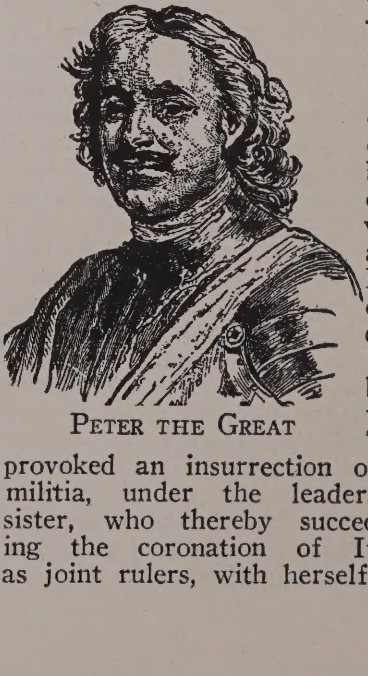
Petain, General Henri Phillipe, was sixty-one years old when, on May 15, 1917, he became Commander-in-Chief of the French armies in the World War. He was born at Cauchy le Tour, in the Department of Pas de Calais, in 1856. When the war began he was merely a retired colonel, a professor of military science at Saumur, although known, like Foch, for his conceptions of strategy and his knowledge of the details of the art of war. He soon became a brigadier-general under Joffre, then, successively, general of division, army corps commander and army commander. He distinguished himself in the retreat from Charleroi, in Artois, the Champagne and the Battle of the Marne, but his highest achievement, up to his appointment as chief commander, was the successful defense of Verdun, the honor of which he shares with General Neville, whose stern "They shall not pass!" became a watchword of the war and one of the classic phrases of military history. Like Pershing he is a tall man, of splendid physique. In 1934 he accepted the portfolio of Minister of National Defense and War in the Doumergue Cabinet.

In contrast to the systematic brutality and barbarism of Germany's war methods, he imposed the death sentence on Rumanian soldiers for offenses against the peasantry when, too late, he was sent to reorganize the defeated Rumanian army.

In the defense of Verdun he often found it necessary to expose himself where there was the greatest danger. To his soldiers he said, "Courage—we shall get them!"

And they did.

Peter the Hermit, the apostle of the first crusade for the recovery of Jerusalem from the Mohammedans, was born at Amiens, France, about 1050. After serving as a soldier he became a monk, and is said to have made a pilgrimage to the Holy Land before 1094, when he began the preaching that started so many thousands on the famous march to Jerusalem. A portion of the first army was led by Peter himself, but at the siege of Antioch he attempted to desert, and, when several miles on his way home, was brought back by the soldiers of Tancred to receive a public reprimand. When Jerusalem was taken by the crusaders in 1099, Peter preached a sermon on the Mount of Olives. At the end of the crusade he returned to Europe and founded a monastery at Huy in Belgium, where he died on July 11, 1115.



Peter the Great

Peter the Great (Peter Alexeievitch, emperor of Russia), was born at Moscow, on June 11, 1672. His father died in 1676, leaving the kingdom to his oldest son, Feodor, Peter's half-brother. Feodor died in 1682, without issue, after naming Peter as his successor to the exclusion of Ivan, his own full brother, who was weak-minded. This however, provoked an insurrection of the *strelzi* or militia, under the leadership of Ivan's sister, who thereby succeeded in obtaining the coronation of Ivan and Peter as joint rulers, with herself as regent. Immediately after his coronation Peter was placed under the instruction of François Lefort, a native of Geneva, who taught him the arts and sciences of civilization and showed how far Russia was behind other European nations. In 1689 Peter called upon his sister to resign as regent. She refused, but after a severe contest was compelled to yield and was shut into a convent. Ivan abdicated in 1696. Peter's first care in assuming the government was to reorganize his army, in which he was greatly assisted by Gordon and Lefort, both military men. He also labored to create a navy, and to this end invited skilled engineers and architects from other countries to assist in the construction of his ships; and he himself went to sea on board English and Dutch vessels that he might acquire the art of navigation. Many of the young nobility were ordered to travel in Holland and Italy, to take special notice of all matters in connection with shipbuilding and naval equipment; others were sent to Germany to study the military art. In 1697 Peter set out on his famous visit to foreign countries, and for some time worked as a ship-carpenter at Zaandam in the Netherlands; and to his knowledge of shipbuilding and other trades he added the study of astronomy, natural philosophy, geography and even anatomy and surgery. On the invitation of William III he visited England and for three months, partly in London and partly in Deptford, labored to acquire all kinds of useful information. He returned to Russia in 1698, taking 500 English engineers, artisans etc., and immediately proceeded to the execution of various reforms in his government Among others was the introduction of arithmetic, which was unknown in Russia up to this time, accounts having been previously kept by means of the abacus (*q. v.*). Trade with foreign countries was not only permitted but insisted upon. Many changes in manners and dress were prescribed and enforced and the czar's reforming zeal even extended to the national church.

On May 27 1703, Peter laid the foundation of St. Petersburg, the new capital of Russia, although at the time engaged in a bitter war with Charles XII of Sweden. In this long contest the Russians were nearly always defeated, but at the battle of Pultowa, July 8, 1709, Charles' forces were completely routed, and Peter next year took possession of the Baltic provinces and a portion of Finland. In 1712 his marriage with Catherine, his mistress, was celebrated at St. Petersburg, and all the offices of the central government were transferred to the new capital. In company with the czarina he made another tour of Europe in 1716–7, this time visiting Paris and carrying home quantities of books, paintings and statues. Soon after this his son, Alexei, who had opposed some of his father's reforms, was condemned to death and died in prison. Many nobles implicated in his treasonable plans were punished. After concluding peace with Sweden in 1721, Peter made war upon Persia in order to open the Caspian Sea to Russian commerce, by which he secured three Caspian provinces and Derbend and Baku. His last years were chiefly employed in improving his capital and carrying out plans for the diffusion of education among his subjects. He died at St. Petersburg, Feb. 8, 1725, and was succeeded by his empress, under the title of Catherine I. Consult Browning's, Motley's and Schuyler's lives of Peter.

Peter II (of Russia), the sole male representative of Peter the Great, being the son of the unfortunate Alexei, was born at St. Petersburg, Oct. 23, 1715. On the death of Catherine I he ascended the throne in 1727, but after a reign of a little over two years, died of the smallpox, Jan. 29, 1730.

Peter III (Feodorovitch, of Russia), grandson of Peter the Great, being the son of his oldest daughter, Anna Petrowna, was born at Kiel, Jan. 29, 1728, and in 1742 was declared by Czarina Elizabeth her successor. Peter succeeded Elizabeth on her death in 1762, and his first act of authority was to restore East Prussia to Frederick the Great, whom he greatly admired, and to send to his aid a force of 15,000 men. He also recalled a great many political exiles from Siberia. While he was arranging a campaign to take Sleswick from Denmark, soon after his inauguration an insurrection, headed by his wife and the principal nobles, broke out against him in St. Petersburg, a conspiracy which originated in the discontent over his liberal policy, his preference for the Germans, his indifference to the national religion and his servility to Frederick the Great. The result of this conspiracy was that Peter was declared to have forfeited his crown, and was soon after strangled in his bed in 1762 by Orloff and other conspirators. He was succeeded by his wife as Catherine II.

Peter, King of Servia, was born at Belgrade in 1846. His grandfather was George Petrovitch, known as Czerny George, who led the Servians in their struggle for independence against the Turks and whose son, Alexander, was made reigning prince in 1842, but deposed by the National Assembly in 1858 and subsequently banished. Peter was put to school in Hungary, and later entered the French military school of St. Cyr. He graduated, became an officer in the French army, and served with distinction in the Franco-German war. He was captured three times by the Germans, but each time escaped. Afterwards he for years lived a life of extravagance and dissipation in Paris. Then, aroused by the troubles in the Balkans, he actively encouraged the rising of 1875–6 in Herzegovina which culminated in the Russo-Turkish war of 1877–8 and the complete establishment of Servian independence. After a period of roving he went to Montenegro and in 1883 married the Princess Zarka, the oldest daughter of Prince Nicholas. This marriage eventually served to connect him both with the Russian and the Italian court. Princess Zarka died in 1890, and Peter went to Geneva, Switzerland, to put his children in school, where he lived quietly until 1903. On June 11th, 1903, the king and queen of Servia (*q. v.*) were murdered. Peter was elected king four days later. He entered Belgrade, after an absence of forty years, on June 24th, and on the following day took the oath of office and assumed the regular royal rights and duties. He received his crown on October 9th, 1904.

Peter, St., one of the twelve apostles of Jesus, was born at Bethsaida on the Sea of Galilee, but during the public ministry of Jesus had his home at Capernaum, where he appears to have lived with Andrew, his brother. His original name was Simon, to which Jesus added Cephas, from the Syriac *kepha*, a rock, the Greek word being *petra*, whence Peter. He was a fisherman, and was engaged in his daily work when Jesus called him and Andrew to be disciples, promising to make them "fishers of men." Peter undoubtedly was regarded by Jesus with special favor and affection. In many respects he was an ideal disciple, warmly attached to his Master and ardent, fearless and energetic in the service of the cause he had espoused. It is not without reason, therefore, that Matthew heads his list of apostles with "the first, Simon, which is called Peter." This position of leadership among the apostles Peter continued to hold. Peter was the first mover in the election of a new apostle in place of Judas Iscariot; he was the spokesman of the other apostles on the day of Pentecost; and when Ananias and Sapphira were brought before the council, he was the judge who condemned them; and he was the first apostle to baptize a Gentile convert. Peter took an active part in the apostles' conference in Jerusalem, and at Antioch he labored in harmony with Paul for a time, but afterward arose the famous dispute between them, in which Paul says "he [Peter] was to be blamed" for separating himself from the Gentile converts and refusing longer to eat with them, lest he might offend certain Jewish converts. But Peter and Paul adjusted their differences, and Peter's references to Paul in his (Peter's) epistles are of the most appreciative kind. The history of Peter from this time rests mainly on tradition. It is generally believed that after remaining in Antioch for some time — according to Jerome and Eusebius he was bishop there for years — his missionary labors extended to Pontus, Cappadocia, Galatia, Bithynia and, some have thought, even to Babylon. It is now generally conceded that he paid one or more visits to Rome and that he suffered martyrdom there. Tradition records that Peter was crucified with his head downward, he himself requesting this as being unworthy to be crucified in the same position as his Lord. Sienkiewicz makes him a heroic figure in *Quo Vadis.*

Pe'ter'borough, Can., has a population of 15,000. It is on Otonabee River, which furnishes electrical energy for numerous factories. Its normal school, collegiate institute and library are important educational features. It has an extensive plant for the manufacture of electric machinery and appliances and a large cereal-food establishment. There are summer resorts on the nearby Kawartha Lakes.

Pe'ters, Christian Henry Friedrich, a highly-distinguished American astronomer, was born at Koldenbüttel, Germany, Sept. 19, 1813. After completing his course at the University of Berlin, he traveled for several years in Palestine and other countries in the east. He then came to the United States, and, after serving in the coast survey, was elected professor of astronomy at Hamilton College, New York, in 1858. Professor Peters took part in the observation of the solar eclipse of Aug. 7, 1869, at Des Moines, Ia., and was at the head of the party sent by the United States government to New Zealand to observe the transit of Venus on Dec. 9, 1874. His party obtained over 200 photographs of the transit, and he was able to measure the apparent diameter of the planet, thus determining its size more nearly than had ever been done before. He died at Clinton, N. Y., July 18, 1890.

Pe'tersburg, Va., the third city of Virginia, on the left bank of Appomattox River, 23 miles by rail south of Richmond. The falls above the city furnish water-power for foundries, cotton, flour and paper mills and tobacco factories. The ten months' siege of Petersburg was an important chapter in Grant's campaign against Richmond in 1864 Although attacked several times, it did not fall until evacuated by the Confederates in the spring of 1865. Population 40,000.

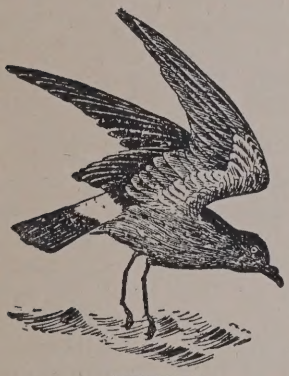
Pe'terson, William, M.A., LL.D., C.M.G., principal of McGill University at Montreal since 1895, was born in Edinburg, May 29, 1856, and educated at the high school and university there and at the universities of Göttingen and Oxford. He has been given honorary degrees by the Universities of St. Andrews, New Brunswick, Princeton, Yale, Johns Hopkins and Pennsylvania. In addition to writing *The Relation of the English-Speaking Peoples* Dr. Peterson has edited many Latin works.

Pet'iole, the stalk-like portion of a leaf, as distinguished from the blade. Leaves without petioles are said to be sessile. See LEAF.

Petiolule (*pĕt'ĭ-ō-lūl*), in compound leaves the stalk-like portion of a leaflet, as distinguished from the general stalk or petiole of the whole leaf.

Petrarch (*pē'trärk*), **Frances'co,** one of the earliest and greatest of modern lyric poets, was born at Arezzo, Italy, July 20, 1304, his parents being exiled from Florence at the time. The poet's infancy was passed in Tuscany until 1312, when his father determined to go to Avignon, whither the papal court had been transferred. There his studies began, and were continued later at Montpellier and Bologna. After his father's death Petrarch returned to Avignon. Having lost a large portion of his patrimony, he qualified for ecclesiastical preferment, but never took holy orders. It was in this early period that he first saw Laura, whose name he has immortalized in his lyrics, and who inspired him with a passion which, although unrequited, has become proverbial for its constancy and purity. The fame of Petrarch's learning and genius was such that he received the highest consideration from rulers and learned men; but the most glorious day of his life was when he was crowned poet-laureate by the senate of Rome on Easter Sunday of 1341. He died on July 18, 1374. See Henry Reeve's little book on Petrarch.

Pet'rel, the name for small sea-birds often seen flying over the ocean, the smallest of the web-footed birds. By the sailors they are commonly called Mother Carey's chickens. There are two kinds in the North Atlantic: Wilson's petrel and Leach's. The former nests in the southern hemisphere in February, and comes north in May. It is the form most frequently seen in crossing the Atlantic. They follow the ship for food thrown overboard. Leach's petrel nests on our coast from Maine northward, the nest a burrow under rock or in the ground, one white egg therein. Both these birds are small, being about seven and one half inches long. They are black with a white spot on the upper side at the base of the tail. Petrels number about seventy species. Several inhabit the southern seas, and the group includes the giant fulmar, about the size of one of the smaller albatrosses. The name petrel is a diminutive of Peter, and refers to the appearance they present of walking on the water.

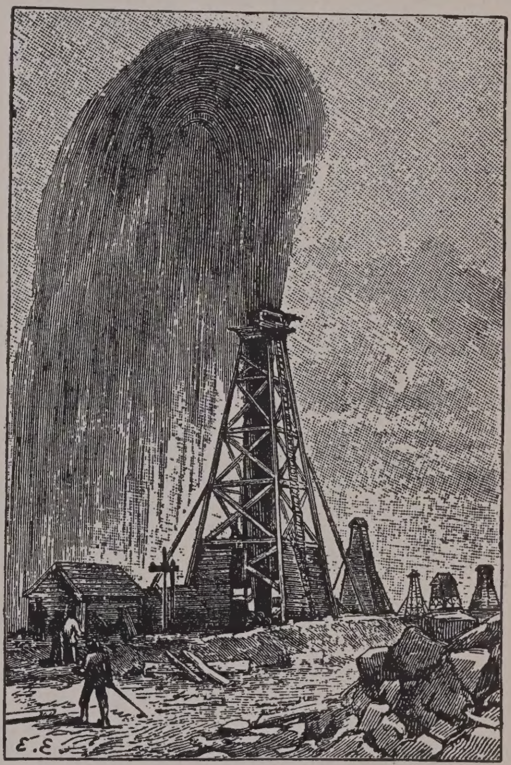


PETREL

Pe'trie, William M. F., an English author and explorer, was born at Charlton, England, June 3, 1853. Having been educated privately, he early devoted himself to a study of ancient British earthworks, but in 1880 turned his attention to the Nile valley, where he has been practically ever since, although holding a professorship in University College, London, in the department of Egyptology. He discovered the Greek settlements at Naukratis and Daphnæ; the prehistoric Egyptian settlement at Koptos; and the home of a new race at Nagada. He published an inscription of the Israelite war at Thebes. During the years he has been in Egypt he has published many volumes upon the life and history of the ancient Egyptians. Perhaps that which attracted the most attention was the report of his work at Tel-el-Amarna, a modern Arab village on the eastern side of the Nile, midway between ancient Thebes and Memphis, where Amenophis IV, the "heretic" king, built his royal residence about 1500 B. C. A great many tablets in cuneiform characters were found, which are in the museums of London, Berlin and Cairo. These contain many names known to Bible students.

Petrograd. See St. Petersburg.

Petro'leum, a fluid bitumen (*q. v.*), also known as mineral oil, rock-oil etc. In nature it occurs principally in the pores of porous rock. It is extracted from the rock through wells, the same as water. The origin of petroleum has been much discussed, and the general belief is that it represents a distillation product of organic matter which was buried in the sediments when they accumulated. It is quite probable that both animal and plant matter have contributed to the production of petroleum. In profit-



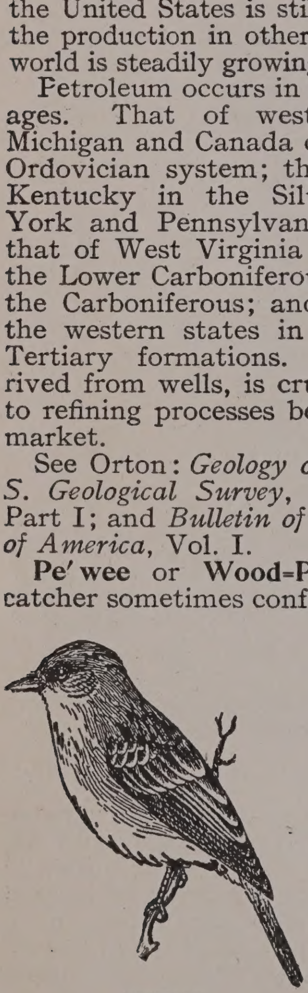
OUTBURST OF PETROLEUM FROM WELL

able petroleum-wells the porous layer containing the petroleum is usually covered by a relatively impervious layer, which prevents the oil from escaping upward. When well-boring penetrates this impervious layer, the oil has a chance to escape. It sometimes spouts with great force, like water in flowing wells. In other cases it has to be pumped. A well which flows when first made, often ceases to flow later and its oil has to be pumped. Still later it may cease altogether to yield oil, because the reservoir (the porous rock) from which it drew its supply, is exhausted. The average length of life of an oil-well is but a few years. The yield is very variable, some yielding but a few barrels a day, while others yield hundreds or even thousands a day. Such extraordinary flows are usually of short duration.

Petroleum is found in various parts of the world, the United States and Russia being the chief sources of supply. In the United States petroleum-wells were first developed in Pennsylvania, Ohio and West Virginia, but now extensive deposits have been opened in many other states, including Indiana, Illinois, Kentucky, Texas, Kansas, Oklahoma, Colorado and California. While the United States is still the largest producer the production in other fields throughout the world is steadily growing.

Petroleum occurs in formations of various ages. That of western Ohio, Indiana, Michigan and Canada occurs in rocks of the Ordovician system; that of Tennessee and Kentucky in the Silurian; that of New York and Pennsylvania in the Devonian; that of West Virginia and eastern Ohio in the Lower Carboniferous; that of Kansas in the Carboniferous; and that of Texas and the western states in the Cretaceous and Tertiary formations. Petroleum, as derived from wells, is crude, and is subjected to refining processes before it is put on the market.

See Orton: *Geology of Ohio*, Vol. VII; *U. S. Geological Survey*, 8th Annual Report, Part I; and *Bulletin of the Geological Society of America*, Vol. I.



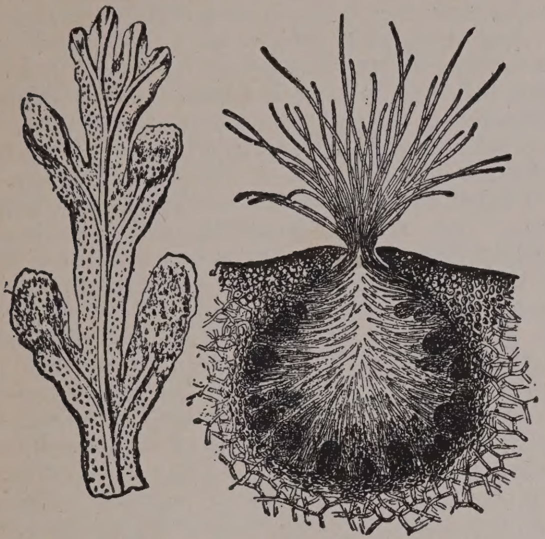
PEWEE

Pe'wee or **Wood-Pewee,** a small fly-catcher sometimes confused with the phœbe. It is smaller than the latter, being about six and one half inches long, a trifle larger than the English sparrow. Its wings are decidedly longer than its tail; it is dark olive-green above, below whitish tinged with yellow; the under bill is yellow. Unlike the phœbe, it is shy rather than sociable, uttering its plaintive cry, even in the hottest days of mid-summer. It is a forest bird, one of the few birds fond of deep shade, is much at home high in tree-tops, common in old orchards where insects abound, and is occasionally seen in garden and road-side trees. It ranges in eastern North America from Florida to Canada, and is one of our common summer residents. It arrives from the south toward the middle of May and returns south in October, wintering in Central America. During the nesting season it seeks deep seclusion and on a limb 20 or 40 feet above ground builds its nest, a rival to the humming-bird's in beauty. The nest is flat, made of moss, fine grasses and rootlets and cleverly edged with lichen or moss so that it may seem a very part of lichen or moss-covered limb. There are three or four cream-white eggs with lilac spots at the larger end. It has a dreamy note of *pee-a-wee.*

Phædra (*fē'drȧ*), the wife of Theseus, is the central figure of a tragic story in Greek mythology, which was made the subject of dramas by Euripides and Sophocles. These dramas are now lost; but there is a tragedy upon the theme by Racine. Phædra fell in love with the youthful Hippolytus, a son of Theseus and Hippolyte. The youth repelled her advances, whereupon she made a false accusation against him to Theseus, who in his wrath put Hippolytus to death. The queen, repenting of her crime, confessed all, and took her life with her own hand.

Phædrus (*fē'drus*), translator of Æsop's (*q. v.*) *Fables* from Greek into Latin verse. While still young he came to Italy, and in Rome or some other city studied Ennius, whom he quotes in the epilogue to his third book. From the title of this book he appears to have been first the slave and afterwards the freedman of Augustus. Although Phædrus only claimed to be a translator of Æsop, he was more; he wrote fables of his own, using the name of Æsop to recommend his verses. Phædrus lived in the early part of the first Christian century.

Phæophyceæ (*fē'ō-fĭs'ē-ē*), plants forming one of the great groups of algæ, commonly known as the brown algæ or kelps. Almost all are marine, and are characteristic forms of the coast. All are anchored forms, their floating olive-green, yellow or brown bodies usually being buoyed by floats or air-bladders. The largest kelps are in the colder waters, and are also called wrack, tangle, dangle etc. Some are filamentous forms, but others are much more complex. The species of *Laminaria* are like huge floating and rooted leaves, frequently nine to ten feet long. The largest known *Laminaria* is an antarctic form, which rises to the surface from a sloping bottom, with a floating, leaf-like body 600 to 900 feet long. Other forms rise from the sea-bottom like trees, with thick trunks, numerous branches and leaf-like appendages. One of the most common forms is the rockweed or fucus, whose forking body is full of swollen air-bladders. The noted *Sargassum* or gulf-weed is a member of this group. It is often torn from its anchorage by the waves and carried away from the coast by currents, collecting in the great sea-eddies produced by oceanic currents and forming Sargasso seas, as that of the North Atlantic.



FUCUS OR ROCKWEED

The figure to the right shows the receptacle which contains the sex organs.

Phaethon (*fā' ē-thŏn*), "the shining one" in the writings of Homer and Hesiod, a frequent title of Helios the sun-god. In Greek mythology Phaethon also is the name of a son of Helios, famous for his unfortunate attempt to drive his father's chariot. Scarcely had the presumptuous youth seized the reins when the horses, perceiving his weakness, ran off and, approaching too near earth, almost set it on fire. Earth called upon Jupiter for help, and he struck down Phaethon with a thunderbolt. His sisters, who had harnessed the horses of the sun for him, were changed into poplars and their tears into amber.

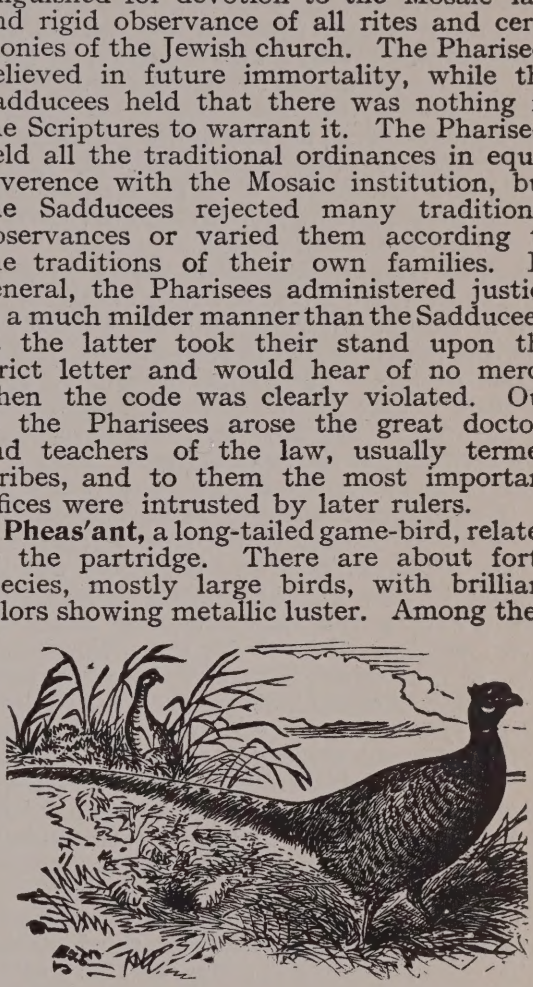
Pha'lanx, the ancient Greek formation for heavy infantry, was a series of parallel columns standing close one behind the other. The oldest phalanx was the Spartan, in which the soldiers stood four, six or more, generally eight, deep. The Macedonian phalanx was 16 men deep. The heavy-armed phalanx was ordinarily flanked by peltasts or light infantry, who usually fought with javelins and slings.

Phanerogams (*făn'ẽr-ŏ-găms*), a name commonly applied to the spermatophytes or seed-plants, but now passing into disuse. It was given in contrast to cryptogams (which see), and means that the sexual reproduction is evident, the stamens and pistils being mistaken for sexual organs. See SPERMATOPHYTES.

Pharaoh (*fā'ro* or *fā'ra-o*), the name or title given in the Bible to the monarchs of Egypt. Like *Mikado* and *Sublime Porte*, it means *The Lofty Gate.* Although the term is only an official title, it is generally used as if it were a proper name; and there has been great difficulty in determining the particular monarchs who pass under this title in the Old Testment.

Phar'isees, a Jewish sect or school distinguished for devotion to the Mosaic law and rigid observance of all rites and ceremonies of the Jewish church. The Pharisees believed in future immortality, while the Sadducees held that there was nothing in the Scriptures to warrant it. The Pharisees held all the traditional ordinances in equal reverence with the Mosaic institution, but the Sadducees rejected many traditional observances or varied them according to the traditions of their own families. In general, the Pharisees administered justice in a much milder manner than the Sadducees, as the latter took their stand upon the strict letter and would hear of no mercy when the code was clearly violated. Out of the Pharisees arose the great doctors and teachers of the law, usually termed scribes, and to them the most important offices were intrusted by later rulers.

Pheas'ant, a long-tailed game-bird, related to the partridge. There are about forty species, mostly large birds, with brilliant colors showing metallic luster. Among their colors are gold, copper, scarlet, green and blue. They mostly are natives of Asia and live in dense woods. The so-called English pheasant was naturalized in Great Britain before the Norman conquest, and is bred in the game-preserves of Europe. It has been introduced into the United States. The male has metallic tints of blue and green on the breast. It is about three feet long, including the tail, which represents half the length. The copper-pheasant of Japan and the ringed-neck pheasant of China have been introduced into this country. The pheasants of China, Thibet, India and the Malay Archipelago often are gorgeous in



PHEASANT

plumage. The golden pheasant of China and Tibet is striking, being mostly golden above and scarlet below, with a ruff of orange and black. The silver pheasant is silvery white above, penciled with black. Both birds have been introduced into Europe and America. The tail sometimes is very long, for example, in Reeve's pheasant of China it is five and one-half feet. The ruffled grouse of North America is incorrectly called pheasant. It has been given this name in the South and in the North it is called partridge. Our only native representative of the pheasant family is the wild turkey, once so generally abundant in the United States. With the introduction of foreign species, however, which has met with marked success, the wild turkey has gradually disappeared. The ring-tailed pheasant is a beautiful and valuable game-bird. In introducing and rearing this bird, the Eastern and Middle States have taken part, following the example of the Pacific Coast.

Phelps (*fĕlps*), **Elizabeth Stuart** (Mrs. Herbert D. Ward), an American author, was born in Boston, Massachusetts, on August 13, 1844, the daughter of the Rev. Austin Phelps of the Andover Theological Seminary, and Elizabeth Stuart Phelps, a popular author in her own name. Much of her life was spent at Andover. There she was active in local organizations and reform movements such as the Temperance Movement in Gloucester. In 1888 she was married to the Rev. Herbert D. Ward. After her marriage her home was in Newton Centre, Massachusetts. Besides lecturing, writing for magazines, and engaging in various kinds of work for the advancement of women, Elizabeth Stuart Phelps wrote several novels. Among her published works are: *Gates Ajar* (1868); *Old Maid's Paradise* (1879); *Beyond the Gates* (1883); *Songs of the Silent World* (1884); *Gates Between* (1887); *Within the Gates* (1901); *Walled In* (1907), and the *Story of Jesus Christ* (1910). She died at Newton Centre, on January 28, 1911.

Phi Beta Kappa, a collegiate Greek-letter fraternity composed of the first third of the senior class in American colleges. This society was founded on December 5, 1776, in Raleigh Tavern at Williamsburgh, Virginia, by forty-four undergraduates of William and Mary College, of whom John Marshall, afterward Chief Justice of the United States, was one. Branches were established at Yale in 1780; Harvard in 1781; Dartmouth in 1787, and at Union in 1817. Since then chapters have been formed in many universities and colleges. Vassar was the first woman's college to receive a charter. The symbol of the fraternity is a gold panel with the Greek initials representing the Greek words which translated mean "Philosophy the Guide of Life."

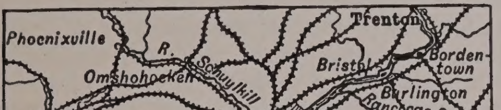
Phi Beta Kappa soon developed into a scholastic honor society and was reorganized as such, with the establishment of a National Council, on September 5, 1883. Today (1934) there are 114 chapters, all of which are active, scattered throughout the country. The total living membership numbers 58,000.

Phidias (*fĭdĭ-ăs*) or **Pheidias**, the greatest sculptor of ancient Greece, was born about 500 B. C. To Phidias came such an opportunity as comes only to few artists. Pericles, having risen to the head of affairs, resolved to adorn Athens with public buildings, and he therefore not only gave Phidias a commission to execute the more splendid statues to be erected, but made him superintendent of all public works planned.

The works of Phidias are what are known today as chryselephantine statues. Such sculpture has an inner core of wood or stone which is covered with plates of ivory to represent human flesh, while the draperies were of gold. He constructed the Propylæa and the Parthenon, the sculptured ornaments of which were executed under his direct superintendence, while the statue of Athené, in ivory and gold, was the work of Phidias himself. Today only the remains of external sculptures of the Parthenon exist as evidence of the great skill of Phidias. He also executed a colossal gold and ivory statue of Zeus for the Olympian temple in Elis. This work is considered his masterpiece. In his later years Phidias was accused of appropriating a portion of the gold designed for the robe of Athené and of impiety in having placed his own likeness and that of Pericles upon the shield of the goddess, and was thrown into prison, where he died about 430 B. C.

Philadelphia (*fĭl-ȧ-dĕl′fĭ-ȧ*), called the "Quaker City" and the "City of Brotherly Love," is the chief city of Pennsylvania, the third largest and the third richest city in the United States and a city of Philadelphia County. It is situated in southeastern Pennsylvania at the confluence of the Delaware and Schuylkill rivers, eighty-eight nautical miles from the Atlantic Ocean. It is centrally located on the North Atlantic seaboard, ninety miles from New York City, ninety-six miles from Baltimore and 132 miles from Washington, D. C. The city, which ranks as the second port of the Atlantic Ocean, to which it has a deep-water outlet through the Delaware River and Delaware Bay, occupies a peninsula about two miles wide between the Delaware and Schuylkill rivers, and extends in a southwesterly direction beyond the Schuylkill, occupying both its shores. The area of the city proper is about 130 square miles, and the metropolitan area, which was expanded by the census of 1930, is 902 square miles.

Description. Although municipal engineering has done much to level the site of Philadelphia, the streets in the old city rise steeply from the river to Front Street, reminiscent of the bluff which was present when the founders selected the site. There are numerous elevations, such as the one which culminates in Cherry Hill, and the high ground in the northwestern suburbs which is 440 feet above the mean high-water mark in the Delaware River. To the south of the old city, the point of land between the rivers at their source, is situated at a lower level than the waters, which has necessitated extensive dykes and reclamation of the land. Market Street, a thoroughfare 100 feet wide, traverses the city from east to west for its entire length, and divides the streets which intersect it into "North" and "South." The streets are parallel or at right angles to this main highway, except in the northeastern section of the city and the suburbs, where they conform to the Delaware River as it bends eastward.


Phoenixville
Trenton
Bordentown
Bristol
Conshohocken
Schuylkill R.
Burlington
Rancocas Cr.
Palmyra
West Chester
PHILADELPHIA
Media
Camden
Gloucester
Medford
Chester
Woodbury
Atco
Billingsport
Wilmington
Bridgeport
Glassboro
Penns Neck
Newcastle
Williamstown
Winslow
Elkton
Finn Pt.
Newfield
Delaware
Salem
Maurice R.
Cohansey
Gr. Egg Harbour R.
Reedy I.
Stony pt.
Vineland
Townsend
Bay Side
Bridgeton
Millville
Delaware R.
Port Elizabeth
Tuckahoe
Smyrna
Port Norris
Gr. Egg Harbour
Kelly I.
Sea Isle City
Dover
Delaware Bay
ATLANTIC OCEAN
Cape May
C. Henlopen
The Environs of PHILADELPHIA.
ENGLISH MILES
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The business life of Philadelphia is centered around Market Street. The more aristocratic residence section is to be found near Rittenhouse Square. Old established communities such as Germantown, Chestnut Hill, and Fort Washington lie to the north. Wealthy suburbs spread out along the main line of the Pennsylvania Railroad.

Parks. There are 121 parks and public squares, which occupy a total area of 6,751 acres. The largest park is Fairmount, which is also the largest park in the world. It originated in the necessity of protecting the Schuylkill River from an encroaching population, as it is the source of the city water supply. Fairmount Park extends along both banks of this river, covering over 3,400 acres, including 373 acres of water surface. The river banks are preserved in their natural state for several miles above the ancient Fairmount waterworks. Many of the large estates which formerly lined the river have been absorbed in this park, which has also preserved the Wissahickon Valley. This beautiful extension is the valley of the Wissahickon River, a tributary to the Schuylkill. It flows through a deep, narrow gorge six miles long and heavily wooded, which adds some very picturesque scenery to Fairmount Park. Many public memorials and monuments have been placed within its confines, notably the Washington Monument erected in 1897, and memorials to such noted figures as Grant, Meade, and Lincoln. The Centennial Exposition of 1876 was held in this part and Memorial Hall and Horticultural Hall have been preserved from that national celebration, and are used to house appropriate collections. The park also contains an aquarium, the first zoölogical gardens established in the United States, the Grant cottage and the William Penn cottage. Philadelphia has also many small parks. William Penn, who founded the city in 1682, was desirous of having his new settlement be a "green country town." He established five open squares at the center and the four corners of the city. These have been multiplied in all directions, until there are about seventy of these park-like enclosures. The streets of the city are shaded by beautiful trees and the effect is in keeping with the aim of the founder. The climate is warm, with mild winters and sometimes excessive heat in summer.

The Harbor. Philadelphia, which is the second port on the Atlantic Ocean, has an excellent water frontage of thirty-four miles, twenty miles of which is on the Delaware River and fourteen miles on the Schuylkill. Along this frontage have been erected 267 wharves, forty-one railroad piers, and eight municipal piers. There are 12,000,000 feet of storage space. The volume of the Port of Philadelphia, based on 300 eight-hour working days in a year, is such that every nine minutes one ship either enters or leaves the port. Philadelphia is an important factor in the commerce to and from the Pacific ports. The Delaware River has a thirty-five foot channel from the city to the sea, varying in width from 800 to 1,200 feet. Fifty-four steamship lines dock at the Port of Philadelphia, part of which connect the city with European ports. There are several coastwise lines to ports along the Atlantic Coast and the West Indies.

Transportation. Three important trunk line systems of railways connect Philadelphia with the rest of the United States. From the terminals of these lines about 1,000 trains enter and depart daily. There is a Belt Line Railroad serving the waterfront, by means of which freight from any part of the country may be delivered to any steamship wharf of the city, in the cars in which it was shipped, and can be sent from any wharf to any exterior point without rehandling, thus greatly reducing expense. A network of high speed electric lines connect the city with the suburban area, and motor bus transportation is highly developed. Surface trolley lines and buses connect the various sections of the city, two rapid transit lines cutting through the heart of the city in subway tunnels and changing to elevated structures to reach outlying districts and the waterfront. Traffic control and streets combine to make the city unusually easy of access to motorists. Water transportation has been very highly developed. A municipal airport was established in 1927.

Buildings. There are many beautiful buildings in the city, a number of which are of deep historical significance. The French Renaissance City Hall of white marble with a 584 foot tower surmounted by a colossal statue of William Penn, is one of the largest exclusively municipal buildings in the world. In close proximity stands the great Pennsylvania Railroad station. To the north rises the Masonic Temple, which is an outstanding example of pure Norman architecture. Independence Hall is a dignified memorial of the American Revolutionary Days, containing the famous Liberty Bell. Carpenter's Hall is inseparably connected with the first Continental Congress. Of intense significance to every American is the Betsy Ross House on Arch Street in which the first American flag was made. Franklin's tomb is located at Fifth and Arch Streets. The first United States mint stands in the city, and many beautiful Colonial residences are preserved in Germantown. The oldest Church in the city is the Old Swedes, dating back to 1700. Christ Church was erected in 1727 on the site of the first building of 1695. In its pews sat at worship Presidents Washington and Adams, and Benjamin Franklin. Construction was begun on St. Peter's in 1758 and St. Paul's is nearly as old. The oldest Catholic Church in the city is St. Mary's, consecrated in 1763. Swedenborgianism originated in Philadelphia and to-day is represented by two churches there. There are many other churches of handsome design. The more modern buildings include the Federal Building, an imposing structure of granite; the United States Mint; the Arcade; the Stock Exchange; the Commercial Museum, and a number of notable office buildings, including those of the Curtis Publishing Company. The original Quaker simplicity of idea resulted in years of building block after block of residences of red brick with white marble trimmings. Only within comparatively recent years has the custom been broken in the newer section where there are many varieties of architecture. Educational buildings are important and handsome, including modern elementary and high school buildings. The Pennsylvania Academy of Fine Arts, founded in 1805, is the oldest art institution in the country. The city is noted for its medical colleges of excellent rank, including Jefferson, Hahnemann, Medico-Chirurgical, Polyclinic, the Women's Medical College and the Medical College of the University of Pennsylvania. Philadelphia is the seat of the State University, and of Girard College, as well as many other colleges, technical and professional schools and charitable institutions. The Academy of Natural Sciences, founded in 1812, is the oldest institution of its kind in the country, as is the American Philosophical Society, founded in 1743 by Benjamin Franklin. The Eastern Penitentiary, a State institution, occupies nearly eleven acres near the entrance to Fairmount Park. Moyamensing, the county prison, is a model in method and management as well as architecturally.

Industry. The city of Philadelphia is an important wholesale distributing point, and one of the largest manufacturing cities in the Union. Among its chief industries are printing and publishing; knit goods; sugar refining; electrical supplies; clothing; foundry products; leather products; slaughtering and meatpacking; the making of worsted, woolen and cotton goods; cigars and cigarettes; car repairs; carpets and rugs, and confectionery. There are also shipbuilding yards, chemical establishments, and a considerable trade in metal products, iron and steel implements, petroleum and petroleum products. The nearness of the city to the Pennsylvania coal and iron deposits has led to much trade in these minerals and their products.

Population. According to the census of 1930, Philadelphia had a total population of 1,950,961. Including the entire metropolitan area, its population was 2,813,682. Of this population of Philadelphia proper, 1,359,833 were native whites; 368,624 were foreign born whites; 219,599 were Negroes, and 2,905 of other races.

Government. In 1919 the city charter of Philadelphia was revised. The Mayor is elected for a single four-year term. He is assisted by a unicameral Council of twenty-one members, also elected for four years. The heads of executive departments are appointed by the Mayor, except for the Civil Service Commissioner, who is chosen by the Council; and the Receiver of Taxes, City Treasurer and City Comptroller, who are elected by popular vote. Finances are managed by means of budget recommendation from the Mayor to the Council which determines by ordinance the financial program for the year and sets the tax rate.

History. The first settlers at the site of this city were a group of Swedes in 1636. The permanent settlement was not effected until 1681 however, in which year William Penn received a royal charter for all Pennsylvania. William Markham, as Governor, was sent out from England and made a settlement on October 7, 1681. Penn arrived in 1682, took formal possession of the land, and laid out a site for the capital, naming it Philadelphia, which means "the City of Brotherly Love." A treaty was concluded with the Indians in 1683 under the famous "Treaty Elm" which spared the city the horrors of aboriginal warfare. In that year a number of German immigrants accepted Penn's invitation, landed and settled at what is now Germantown, which has for long been a part of Philadelphia. The influence of the Quakers and Germans, benign, peace-loving people, fixed the customs and trend of the city. When Penn returned to England in 1684, the city already had 300 houses and 2,600 inhabitants. He returned in 1699 to find 700 buildings and 4,500 inhabitants, a community with characteristics distinctly its own. In 1701 Penn gave Philadelphia a charter and it remained the capital of the State until 1799. Perhaps no other one person, aside from William Penn, himself, was as influential in building the city as was Benjamin Franklin. He moulded public opinion sharply through his *Pennsylvania Gazette* (1729), his *Pennsylvania Journal and Weekly Advertiser*, begun in 1742, and *Poor Richard's Almanac and Plain Truth.*

The Quaker spirit of the city opposed warfare, but Philadelphia was nevertheless the seat of many important Revolutionary events. The first and second Continental Congresses met in Philadelphia. Washington was appointed Commander-in-Chief of the Army. The Declaration of Independence was signed in the State House, while the old Liberty Bell rang out. The British held the city from September 27, 1777, to June 17, 1778. The Constitution of the United States was adopted in Philadelphia in 1787 and from 1790 to 1800, the city was the seat of the Federal Government. The first Abolition Convention met in Philadelphia in 1794. Yellow fever and cholera ravaged the city in 1793 and 1798, and again in 1832. Philadelphia suffered in 1844 by an Anti-Catholic mob uprising. The Civil War drained the city of its men. Philadelphia celebrated a number of her notable events, by such national festivals as the Centennial Exposition of 1876, in commemoration of the declaration of American independence; the 1882 bi-centennial in honor of the landing of William Penn; and the 1887 centennial of the signing of the Constitution. A celebration in 1908 commemorated the signing of the Constitution 250 years previously. Notable among city events of the last century have been a number of industrial strikes.

Philæ (*fī'lē*), an island in the Nile, near Assuan and south of Syene in Nubia. It is situated near the first cataract, and is a small granite rock, fringed with rich verdure, about 1,200 long and 450 feet broad, almost covered with ancient buildings of great architectural beauty. The kiosk, Pharaoh's bed, a roofless hall, belongs to the Greek and Roman period, and consists of fourteen great columns with capitals of various patterns, joined at the lower part by solid walls, sixty-three feet long and forty-eight feet wide. The great temple of Isis, to whom the island was sacred, was built by the Ptolemies. It contains representations of the birth, bringing up, death and embalmment of Osiris. It was converted into a Christian church in 557 A. D.

See Assuan Dam.

Philemon (*fī-lē'mŏn*) and **Baucis** (*bô'sĭs*), in classical mythology, a married couple in Phrygia, famed in antiquity for true love and splendid hospitality. Ovid, the Latin poet, in *Metamorphoses*, tells how once Jupiter and Mercury wandering through Phrygia, both in human form, presented themselves at many a door as weary travellers seeking rest and shelter, and the inhospitable inhabitants would not receive them. At last they came to the small thatched cottage of Philemon and Baucis, and were received most hospitably. Philemon placed a seat and Baucis, bustling and attentive, spread a cloth upon it and begged the visitors to be seated. The fire was kindled and food prepared, and a beechen bowl was filled with warm water that the guests might wash. Wine was served with the food, and while the repast proceeded Philemon and Baucis were astonished that the wine, as fast as poured out, renewed itself in the pitcher. Thus they recognized their divine guests. They immediately fell upon their knees and begged forgiveness for their poor entertainment. Jupiter spoke of the inhospitable treatment that they had received from their neighbors, then led them to a nearby hill where they saw their own humble cottage turned into a magnificent temple while their neighbors were destroyed by a flood which Jupiter caused. Philemon and Baucis, in accordance with their own expressed wish, were made priests and guardians of the temple, where they served many years, and left this life at one and the same hour. Mythology holds that at death Philemon was changed into an oak and Baucis into a linden.

Philip, The Apostle, one of the twelve apostles of Jesus, was of Bethsaida in Galilee. Mention of Philip is not as frequent in the New Testament as of the other apostles. References in the Book of John to Philip reveal a man truly appreciative of the religious element in the mission on earth of Jesus the Christ. Although keenly appreciative, Philip did not entertain a confidence which made possible the practical application of that religious element to his daily material problems. Philip the Apostle is not infrequently confused with Philip the Evangelist primarily because of his work after the death of Christ which is involved in tradition.

Philip the Bold, the son of John the Good of France, and founder of the second and last ducal house of Burgundy, was born on January 15, 1342. He was present at the battle of Poitiers in 1356, when only fourteen years of age, and displayed such heroic courage in risking his own life to save his father's, that he earned the title of *Le Hardi* or "The Bold." He shared his father's captivity in England, and upon his return to France in 1360, received, as a reward of his bravery, the duchy of Touraine. In 1363, upon the death of Philippe de Rouvre, he received the duchy of Burgundy. Flanders, Artois, Rethel, Nevers and the county of Burgundy fell to him by the death of his father-in-law, the count of Flanders, in 1384, and his firm and wise government quickly won esteem and affection from his subjects. He encouraged arts, manufactures and commerce, and his territory was one of the best governed in Europe. During the minority and imbecility of Charles VI of France, his nephew, he acted as regent of that kingdom, and displayed great wisdom and ability both in preventing insurrection within the state and in defending it against the attacks of the English. He died on April 27, 1404.

Philip the Good, son of John the Fearless and grandson of Philip the Bold, was born at Dijon, June 13, 1396. In order to avenge the death of his father, who had been assassinated on the bridge of Montereau at the instigation of the dauphin (afterward Charles VII), when he succeeded to the duchy he entered into an alliance with Henry V of England, recognizing him as the rightful regent of France and heir to the throne after Charles VI's death. This agreement, although it disregarded the terms of the Salic law, was sanctioned by the king and the states-general of France in the treaty of Noyes in 1420; but the dauphin refused to accept it and took up arms. He was, however, defeated at Crévant and Verneuil, and driven beyond the Loire. Some time after this, on account of insults from the English viceroy, Philip made a final peace with Charles, who gladly accepted the hard conditions prescribed by Philip. The English in revenge committed great havoc among the merchant navies of Flanders (*q. v.*), which so irritated Philip that he declared war against them and, with the assistance of the king of France, gradually expelled them from their French possessions. Under Philip, Burgundy was the most prosperous and tranquil state in Europe; and in spite of the several insurrections in Ghent and in Bruges, caused by the imposition of heavy taxes, he was greatly beloved by his people. He died at Bruges, July 15, 1467. See Barante's *History of the Dukes of Burgundy and the House of Valois.*

Philip II of France, called Philip Augustus on account of his great abilities and successful administration, was born on August 21, 1165, and died at Nantes, July 14, 1223. He was crowned joint king with Louis VII, his father, in 1179, and on the death of the latter in the year following he came into full possession of the kingdom. He was one of the greatest monarchs of the Capetian dynasty, while he confirmed his power by marrying Isabella of Hainault, the last direct descendant of the Carlovingians. On the accession of Richard the Lion-hearted (*q. v.*) to the throne of England in 1189, Philip and he set out together on the third crusade. After staying three months in the Holy Land, Philip returned home, binding himself by a solemn oath not to molest Richard's dominions; but very soon after his arrival in France he invaded Normandy while Richard was a prisoner in Germany. Richard's release from imprisonment and his return to England occasioned a war between the two monarchs, which continued till 1199, when peace was secured through the mediation of Pope Innocent III. Richard dying shortly after, war again broke out between France and England on account of the rival claims of King John (*q. v.*) and Arthur, his nephew, to Richard's French possessions. Philip espoused Arthur's cause, and after the murder of that prince took possession of Normandy, Maine, Anjou and Touraine, and added them to his dominions. The great victory of Bouvines, which Philip won, Aug. 29, 1214, over the English and Emperor Otho of Germany, firmly established his throne, and he was able to devote the remainder of his life to reforms of justice and to building and fortifying Paris.

Philip IV, surnamed *Le Bel* or The Fair, king of France, was born at Fontainebleau in 1268. He succeeded his father, Philip the Rash, in 1285, and by his marriage with Queen Joanna of Navarre he obtained Navarre, Champagne and Brie. The chief feature of his reign was his contest with Pope Boniface VIII, which grew out of his attempt to levy taxes from the clergy, which the pope directed them not to pay. In 1300 Philip threw the papal legate into prison and summoned the three estates of France — clergy, nobles and burghers — to which Boniface replied with the bull of *Unam Sanctam.* Philip caused the bull to be publicly burned, and confiscated the property of the prelates who had sided with the pope. Boniface then excommunicated him, but Philip sent William of Nogaret to Rome, who, with the aid of the Colonnas, seized and imprisoned the pope. Though released after a few days by a popular rising, Boniface soon afterwards died. In 1305 Philip obtained the elevation of one of his own creatures to the papal chair as Clement V and seated him at Avignon, which was the residence of the head of the church for 70 years thereafter This period of papal history is often called "the 70 years' captivity." Philip compelled the pope to condemn the Templars in 1310 and to decree the abolition of the order two years later. They made a heroic defense, but were condemned and burned by thousands, their wealth being appropriated by the cruel and rapacious Philip. Jacques de Molay, the grandmaster, was burned on March 18, 1314, and at the stake he is said to have summoned Philip to appear before the judgment seat of Alimighty God within a year and a day and the pope within 40 days. Whether this summons was actually uttered or not, both the pope and the king died within the periods assigned, the latter's death occurring on Nov. 29, 1314. Philip strove for the suppression of feudalism and the introduction of Roman law.

Philip VI (of Valois), king of France, was born in 1293, and became regent on the death of Charles IV in 1328. Philip remained regent during the pregnancy of Charles' widow, but when she was delivered of a daughter, he had himself crowned, the Salic law excluding females from the throne. Philip's right was disputed by Edward III (*q. v.*) of England, grandson of Philip IV, whose mother was the sister of Charles IV. Edward claimed that although his mother could not herself inherit the crown of France, he, as her son, might. In support of this claim, weak as it was, Edward declared war against Philip in 1337, which was the beginning of the long wars between England and France, which were brought to a conclusion only by the victories of Joan of Arc (*q. v.*), nearly 100 years later. (See HUNDRED YEARS' WAR.) In 1347 a truce was concluded between the two, which continued till after Philip's death on Aug. 22, 1350.

Philip of Mac'edon, father of Alexander the Great, was born 382 B. C., and came to the throne in 360 B. C. He was surrounded with many difficulties and dangers, all of which soon disappeared before his decision, energy and wise policy. In one year he secured the safety of his kingdom, and was ready to enter upon a policy of aggression, his object being to reduce every Hellenic state. The Greek towns on the coast of Macedonia were the first objects of attack. In Thrace he captured the small town of Crenides, which, under its new name of Philippi, soon acquired great wealth and fame. After a few years of comparative leisure he advanced into Thessaly, and ultimately to the Pass of Thermopylæ, which he did not attempt to force, as it was strongly guarded by Athenians. After capturing all the towns of Chalcidice, the last of which was the city of Olynthus, he made peace with the Thracians and, next year, with the Athenians. It was during this siege of Olynthus that Demosthenes delivered the famous orations in which he sought in vain to arouse his countrymen to a sense of their danger and cause them to resist the aggressions of the powerful and energetic Macedonian. Philip was now requested by the Thebans to interfere in their behalf in the Sacred War raging between them and the Phocians. He marched into Phocis, destroyed its cities, and sent many of its inhabitants as colonists to Thrace. In 339 B. C. the Amphictyonic council, composed of several Grecian states, declared war against the Locrians, and next year it appointed Philip commander-in-chief of all their forces. The Athenians were at last alarmed at his approach into Greece in this capacity, and formed a league with the Thebans against him; but their united forces were utterly defeated at Chæronea in 338 B. C.; and Philip was now master of all Greece. Deputies from the different states met in congress at Corinth, and, after resolving to make war on the Persian king, chose Philip as leader. Philip was busily engaged in preparations for this great enterprise, when he was assassinated at a festival to celebrate the marriage of his daughter with Alexander of Epirus, 336 B. C., and was succeeded by Alexander the Great. Philip was faithless in the observance of treaty obligations and utterly unscrupulous as to the means by which he gained his end; but his great ability both as a king and a soldier is conceded by all historians. See ALEXANDER THE GREAT, DEMOSTHENES and MACEDONIA.

Philip II (king of Spain), son of Charles V, was born at Valladolid, May 21, 1527. In 1543 Philip married Mary of Portugal, and their son was ill-fated Don Carlos. Eight years after her death he married Queen Mary of England, who was several years his senior. After remaining in England with her about a year, he returned to Brussels. By the abdication of his father, Philip became sovereign of Spain, the two Sicilies, the Netherlands, Milan, Naples, Mexico, Peru and the Spanish possessions in Africa and the East Indies. Philip's marriage with Queen Mary was not a happy one; and after her death in 1558 he married Isabella of France. Philip was an intense bigot in religion, and put himself at the head of the Roman Catholic party in Europe; but the main object of his policy was to concentrate all power in himself and to suppress everything in the nature of free institutions within his dominions. He found the inquisition a very effective means of tyranny in Spain; but in the Netherlands a formidable revolt was organized, and, under the leadership of William the Silent, the seven provinces formed the union of Utrecht in 1579, and maintained a successful war against Spain until their independence was fully achieved, although William himself was assassinated at the instigation of Philip in 1584. Philip organized the Invincible Armada for the conquest of England, placing it under Alexander Farnese, Prince of Parma; but only defeat and disaster resulted. (See ARMADA.) The one great triumph of Philip's reign was the naval victory of Lepanto, won by his half-brother, Don John of Austria, over the Turks. The desperate heroism of the Netherlanders and the defeat of the Armada, added to financial distress at home, embittered Philip's last years and he died of a lingering and loathsome disease at the Escorial, Sept. 13, 1598, being succeeded by Philip III, his son by a fourth wife. Philip possessed considerable ability, but little political wisdom. although he undertook many vast enterprises, scarcely any led to a profitable result. He was cold and austere without being virtuous. Although a bigot and a persecutor, he had no real respect for honor or religion. There is hardly a character in history whom historians have more unanimously united in condemning. See the histories of Prescott, Motley and Froude.

Philip V, the first Bourbon king of Spain, was born at Versailles, Dec. 19, 1683, his father being the Dauphin Louis, son of Louis XIV of France. In 1700 the Spanish crown was bequeathed to him by Charles II. He entered in 1701, and after a long struggle with Archduke Charles of Austria was left in possession of his throne by the Peace of Utrecht in 1713. His queen dying next year, Philip soon married Elizabeth Farnese of Parma, the termagant (to use Carlyle's phrase) who for 30 years disturbed the peace of Europe. Her dearest wish was to drive the Hapsburgs out of Italy in the interests of her sons by a former marriage; but all her efforts resulted only in securing the two Sicilies. Spain joined the coalition against Maria Theresa of Austria (*q. v.*); and Elizabeth's younger son was at first successful in conquering the Milanese; but as soon as the Silesian War was closed by the Peace of Dresden, the Austrian queen sent her troops into Italy and drove out the Spaniards. At this crisis Philip, who had been in mental stupor for years, died at Madrid, July 9 1746.

Philip, sachem of the Wampanoag tribe of Indians, was the second son of Massasoit (*q. v.*), who for nearly 30 years had been the stanch ally of the Pilgrim settlers. In 1661 Philip succeeded his elder brother and kept the treaties of his father for several years. But at length, goaded by the encroachments of the whites, he formed a confederation of tribes, amounting to nearly 10,000 warriors, and in 1675 King Philip's War broke out. The Indians surprised and murdered many colonists, but were eventually overcome, and in 1676 Philip himself was captured and slain in Rhode Island. Afterward his body was drawn and quartered and his head was exposed on a gibbet at Plymouth for a number of years. See *Entertaining History of King Philip's War* and Irving's *Sketch-Book*.

Philip, John Woodward, an American naval officer, was born at New York City, Aug. 26, 1840. In 1861 he graduated from the Naval Academy, and served as midshipman on board of various vessels blockading the Gulf harbors and in the James River fleet. He became a lieutenant in 1862; lieutenant-commander in 1866; commander in 1874, captain in 1889, and commodore in 1898. He was wounded at Stone River during the Civil War. During the years of peace he made a tour of the world in command of Woodruff Scientific Expedition (1877). He was in command of the *Texas* during the fight off Santiago Bay in the Spanish-American War; and his request of his men not to cheer over their dying foes excited widespread commendation. He was a very earnest Chrsitian soldier, and led his sailors and marines in prayer at the close of the fight above mentioned. He for a time was in command of the North Pacific squadron, and later assigned to the command of the Navy-Yard at Brooklyn, where he died, with the rank of rear-admiral, June 30, 1900.

Phil'ippine Islands, The, an archipelago in the Pacific southeast of Hong-Kong, China, were discovered by Magellan in 1521. He was slain a few months later upon one of the smaller islands during the progress of one of the numerous tribal wars. Spain attempted to make good her claim to these lands a few years afterwards by sending out an expedition under Villabos, who named the islands in honor of the heir to the Spanish throne, afterward Philip II. In 1565 Legaspi landed at Cebu with 400 troops. This force was increased three years later, and the conquest of the islands was accomplished. The first attempts at settlement were made upon Cebu; but in 1581 Manila was founded, and it has since continued to be the chief city. The islands remained a possession of Spain until ceded to the United States. Previous to this a revolt of the Filipinos under the leadership of Aguinaldo (*q. v.*) occurred. In January, 1898, peace was agreed upon by a compact between the Spanish authorities and Aguinaldo, the terms of which do not appear to have been kept by either party. In April, 1898, war broke out between Spain and the United States, the first serious encounter being the battle of Manila Bay, May 1, 1898, when the Spanish squadron under Admiral Montojo was completely destroyed. At the close of this war Spain (by treaty on Dec. 10, 1898) ceded the Philippines to the United States, $20,000,000 being paid to Spain. Meantime Aguinaldo proclaimed the Philippines an independent republic and thus brought on a conflict between his followers and the United States, which was terminated only by his capture in April, 1901.

By act of Congress (1902) a complete civil government was established and the office of military governor and military rule were terminated. The government is composed of a civil governor and nine commissioners, of whom four are Americans and five Filipinos. There are 37 provinces (1), each with a governor. The supreme court has seven judges. There are 17 judicial districts.

Following an act of Congress, a general election of delegates to the Philippine Assembly was held in 1907; the new assembly was chosen on July 20 and was opened on Oct 10 of that year. Manila, upon the island

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(1)—In addition to the provinces and the departments of Mindanao and Sulu.

HOME LIFE OF FILIPINOS IN THEIR THATCHED HUTS

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PRIMITIVE FILIPINO SCHOOL HOUSE.

of Luzon, with a population of 219,941, is he seat of government.

The islands and islets number about 3,000. The largest are Luzon (40,969 square miles) and Mindanao (36,292 square miles); and the total area of habitable islands, including the Sulus. is estimated to be about 127,853 square miles. There are about 25,000 Americans and Europeans and about 100,000 Chinese. The inhabitants mostly are of the Malayan race. but there are some tribes of Negritos. The population as shown by the census is 8,276,802, of whom a little more than one million belong to wild tribes.

Climate. The climate is one of the most favorable to be found in the tropics. At Manila the mercury during July and August rarely goes below 79° or above 85°. During the year the extremes are 61° and 97°, with an annual mean of 81°.

Resources. Although agriculture is the chief industry, only a small part of the arable land is under cultivation. The soil is very fertile, and with improved methods the cultivatable area is capable of sustaining a much larger population. The Philippine Bureau of Agriculture is carrying on investigations respecting the cultivation and improvement of the islands' products, and experimental farms have been established from which improved varieties of seeds, roots and plants are distributed. Attention is also given to combating destructive insects, methods of curing tobacco, the improvement of live-stock etc. The Philippine Forestry Bureau provides plans and rules for the protection and working of the wide forests of valuable timber, gum and dyewood. Not much has yet been done towards the development of the mineral resources, but preliminary work, prospecting etc. have been actively taken up. Lignite and iron are found in several provinces, and gold in all the larger islands. Silver, platinum, copper, lead, manganese, sulphur, petroleum and gypsum are also found The one chief product is hemp; cocoanuts, sugar, tobacco and coffee following in the order named. The total value of annual imports is about $50,000,000 and of exports approximately $40,000,000.

Education. Education is under the direction of a secretary of public instruction. The islands are divided into 35 educational divisions, each under a superintendent, with a superior school-board and local board. There are 8,500 Filipino primary school teachers. Many are Americans, but the majority are Filipinos paid by the government or the municipalities. English is taught in all the public schools, of which there are over 3,000. A school for training teachers has been opened, and industrial and trade schools established. The University of Manila has several faculties, including one of medicine. There are over 8,000 miles of telegraph lines and cable. A railway 120 miles long has been built between Manila and Dagupan, and three are two branch lines.

Philippopolis (*fĭl'ĭp-pŏp'ō-lĭs*), capital of eastern Rumelia or southern Bulgaria (*q. v.*), on the navigable Maritza, 110 miles from Adrianople. It manufactures silk, cotton, tobacco and leather. Population 45,707, of whom half are Bulgarians, the remainder being Turks, Greeks etc. Philippopolis was occupied by the Russians in 1878, and in 1885 a revolution broke out here which led to the incorporation of eastern Rumelia (*q. v.*) with Bulgaria.

Philistines (*fĭl-ĭs'tĭnz*) (strangers), a people mentioned in the Bible as in frequent conflict with the Jews. They lived on the coast of the Mediterranean to the southwest of Judea. It has been asserted that they originated in prehistoric Crete. Their first appearance as enemies of Israel was during the period of the Judges. They were subject to five princes who ruled over Gaza, Ashdod, Askalon, Gath and Ekron. In the time of Eli they were so powerful that they even carried away the ark. Saul, the first king of Israel, was engaged in frequent conflicts with them, and both he and his sons fell in a disastrous battle against them at Gilboa. David won many victories over them, and under Solomon most of their territory was annexed, and they continued in subjection to Judah until the reign of Ahaz, three hundred years later, when they revolted and made great havoc in the territory of Judah. Hezekiah, the son and successor of Ahaz, however, subdued them and brought them to obedience, without the aid of the Egyptians. Under the later kings of Judah they appear, from the menaces of the prophets, to have brought many calamities on the Jews — if they did not recover their full independence. In the time of the Maccabees the Philistines were Syrian subjects, and in the time of Herod the Great they appear no longer to have an existence as a separate race or nation, even the name of their country being merged in that of Palestine.

Phil'lips Ex'eter Academy, preparatory school in Exeter, N. H., for boys of exceptionally high standing. It was founded in 1781 by Dr. John Phillips, a wealthy and philanthropic citizen of Exeter. It was founded on a broad foundation and has been manned by men who were capable of inspiring pupils with a desire for the best in life. Few institutions even of higher learning have attracted students from a wider field. Among its matriculants are students from most of the states, the District of Columbia, Hawaii and many foreign countries. Its growth during recent years has been marked. Attendance has grown from 192 to 443, buildings from 9 to 17, instructors from 10 to 21 and annual income from $37,000 to $150,000. It is distinctively a preparatory school. About seventy-five per cent. of its graduates actually go to college.

Phillips, Wen′dell, the distinguished orator and abolitionist, was born of wealthy and aristocratic parentage at Boston, Mass., Nov. 29, 1811. After several years' study in the public Latin school he entered Harvard, from which he graduated in 1831. While yet in his collegiate course Phillips was noted not only for superior scholarship but for oratorical gifts and marked purity and dignity of character. In 1834, having taken a three years' course of legal study, Phillips was admitted to the bar at Boston. A little more than a year after entering upon the practice of his profession he saw the mobbing of Garrison (*q. v.*) at Boston, which made a deep and lasting impression and awoke serious thought upon the evils of slavery. It was in Faneuil Hall that Phillips, then only 26, delivered the first of those marvelous philippics that did so much to arouse antislavery sentiment, the occasion being a meeting to denounce the murder of Lovejoy at Alton, Ill., for advocating antislavery sentiments in his paper published at that place. From that time Phillips continued the faithful and unflinching opponent of slavery, raising his voice against it throughout the land and devoting his gifts and varied powers to the single purpose of its abolition and destruction. Although the matter of Phillips' speeches was nearly always fiery and impassioned, his delivery as well as his manner was invariably calm, reserved, perfectly easy and natural, giving him a power over audiences that compelled interest and attention, even when they most disagreed with him. Very appropriately was he called The Unagitated Agitator. He died at Boston on Feb. 2, 1884.

Phillips′burg, N. J., a city of Warren County, on Delaware River, opposite Easton, Pa., where the river is crossed by four iron bridges. It is situated in a fine agricultural, limestone, cement and iron-ore region. Besides extensive ironworks, silk mills, a rolling-mill, boiler and machine works and a reaper and mower factory, there are railroad shops for five railroads. There are good public, parochial and business schools, several churches, municipal buildings and a public library. Population, 18,000.

Philoctetes (*fil-ok-tē′tēz*), a famous archer, the friend and armor-bearer of Hercules, who bequeathed him his bow and poisoned arrows. As one of the suitors of Helen he led seven ships against Troy; but being bitten in the foot by a snake or, according to one account, wounded by his own arrows, as his wound gave forth an unendurable stench, the Greeks left him on Lemnos, where he remained ten years. But an oracle declaring that Troy could not be taken without the aid of Philoctetes, Ulysses and Neoptolemus were sent to Lemnos to bring him to the Grecian camp, where, healed by Æsculapius or his sons, he slew Paris and otherwise assisted in the capture of Troy.

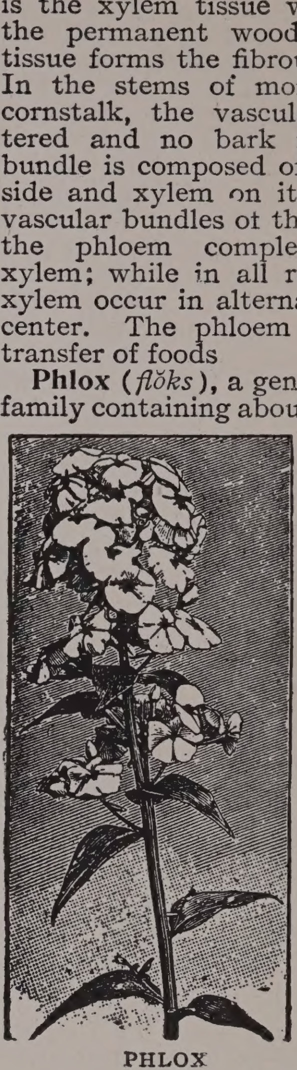
Philology (*fĭ-lŏl′ŏ-gy̆*). This word is derived from two Greek words, *philos*, a friend, and *logos*, a word; and like many other words it has varied greatly in its meaning. In the time of Plato it meant the love of discussion, confined mainly to the moral and social questions in which Plato delighted; and the method of discussion was the Socratic one of asking questions. At Alexandria the philologer gave attention to all the knowledge of his day, brought together for the first time in its great library; but the scholars of Alexandria applied themselves especially to the study of the older Greek literature. It widened again at the revival of learning to include the study of grammar, rhetoric, literature, poetry, archæology — in a word, all the "humane" studies. Since the middle of the 19th century the word has been used in a more restricted sense. Whereas philology formerly meant the study of literature, it is now limted to the study of languages, apart from the literature embodied in them. It is the science which deals with the origin, development and general structure of languages and of language as a whole. In its progress not only has great light been thrown on the origin of different languages; but they have been classified and grouped, and many languages which seemed to have no points of similarity have been traced to a common origin. Sir William Jones, the great oriental linguist, declared that "no philologer could examine Sanskrit, Greek and Latin without believing them to have sprung from the same source, which, perhaps, no longer exists. There is a similar reason, though not quite so forcible, for believing that both the Gothic and the Celtic had the same origin with the Sanskrit." There are two main classes of languages: Those which show no signs of inflection — for example, those in which the plural of man is not formed by a vowel-change (as our men) nor by an added suffix (as in Latin homin-*es*), but by a combination of two words (as our man-kind); and second, those which are inflected in greater or less degree. This class is divided into two great families: the Semitic, comprising Hebrew Aramaic, Arabic, Syriac; the Indo-Germanic or Aryan family, the chief languages of which are Sanskrit, Armenian, Albanian, Latin, Celtic, Teutonic or Germanic and Slavonic. See Isaac Taylor's *Origin of the Aryans.*

Philos′ophy (Greek *philos*, a friend, and *sophia*, wisdom). A complete and final definition of this word is impossible, as the objects of the science, its methods and even the possibility of its being or becoming a science are matters of debate between different schools. Philosophy has been called the mother of the sciences, as it was only by slow degrees that the separate sciences came into life, each developed and formulated by men imbued with the philosophical spirit, which is the "love of wisdom." As the number of special sciences increased, philosophy could no longer in a strict sense "take all knowledge to be her province"; but her claim to be the only science of the universe as a whole was not thereby given up, but rather emphasized. Unity and harmony in one conception of the universe are the aim which philosophy always has in view. Whether this ideal can ever be reached by man is another question; but the conception of a complete system of things satisfactory to the season and the moral sense must ever be the spring and inspiration of philosophical effort. The philosopher, therefore, always has his eye upon the whole, and his function is to study the relation of all the parts to the whole and to one another. No one thing can be fully undertood except in the light of its relation to other things, and therefore the philosopher seeks to penetrate the reason and essence of things and to know the *why* and the *wherefore* of all the phenomena of nature. The history of philosophy is an important part of philosophical study. Indeed, philosophy cannot be studied with profit apart from its history.

Thales of Miletus is generally reckoned the first Hellenic philosopher, and the history of philosophy is generally said to commence at his time. It is usual to divide the history of philosophy into three distinct periods: Ancient or Greek philosophy, from B. C. 600 to about 500 A. D.; medieval philosophy, from 500 to 1600; and modern philosophy, from 1600 to the present era. Ancient philosophy is subdivided into three periods: The pre-socratic philosophers — Pythagoras, Parmenides, Anaxagoras and others — who devoted their attention mainly to the phenomena of external things; Socrates and the sophists who turned man's attention upon himself; and the idealistic systems of Plato and Aristotle. The Stoics, Epicureans, Skeptics and, later, the Neo-Platonists and other schools make up the history of philosophy until the downfall of the Roman Empire and the death of Boëtius. Medieval philosophy is mainly an effort to apply the logic of Aristotle to the doctrines of the church and to harmonize his philosophy with Christian theology. Bacon and Descartes, in the beginning of the 17th century, may be considered the founders of modern philosophy, to give an adequate history of which requires volumes. See English translations of histories by Erdmann. Ueberweg and Schwegler.

Phloem (*flō'ĕm*), (in plants). A woody strand is known as a vascular bundle, because it contains different forms of the cells known as vessels. Each individual vascular bundle consists of two elements, the wood and the bast. The bast elements of a vascular bundle taken together are called the phloem in contrast with the wood elements, called the xylem. In an ordinary tree it is the xylem tissue which accumulates as the permanent wood, while the phloem tissue forms the fibrous lining of the bark. In the stems of monocotyledons, as the cornstalk, the vascular bundles are scattered and no bark is formed, but each bundle is composed of phloem on its outer side and xylem on its inner side. In the vascular bundles of the stems of most ferns the phloem completely surrounds the xylem; while in all roots the phloem and xylem occur in alternate strands about the center. The phloem is concerned in the transfer of foods

Phlox (*flŏks*), a genus of the *Polemonium* family containing about 30 species, which are natives of North America and northern Asia, nearly all of the species being found in North America. They are mostly hardy herbs with usually showy red, violet or white flowers. The perennial species are among the most popular of garden plants. Perhaps one of the best phloxes of cultivation is *P. drummondii*, occurring throughout Texas and cultivated everywhere. *P. subulata* and its varieties are the best known of the dwarf creeping kinds, and are frequently called ground or moss pinks. *P. maculata*, the wild sweet-william probably is the best known and widely distributed of the wild forms.


PHLOX

Phocion (*fō'shĭ-ŭn*), an Athenian general, was born about the end of the 5th century B. C. Although of humble origin, he studied under Plato and perhaps under Diogenes. In 341 B. C. Phocion was successful in overcoming the Macedonian party in Eubœa and in restoring the ascendency of Athens. Next year, being sent to the relief of Byzantium, he forced Philip to abandon the siege of that city and to evacuate the Chersonesus. A little later, however, he placed himself in opposition to Demosthenes and others who advocated resistance to Philip's demands. After the assassination of Philip in 336 B. C. we find him striving to repress the desire for war among the Athenians, on account of which many regarded him as a traitor;

but this charge doubtless was unjust. On the death of Alexander the Great Phocion endeavored in vain to hinder the Athenians from going to war with Antipater. After the death of Antipater he was involved in the intrigues of Cassander, and was forced to flee to Phocis, where he was delivered to the Athenians and condemned to drink hemlock (317 B. C.).

Phœ'be, a small fly-catcher nesting about houses and other structures. Its nest of moss and mud may be placed under bridges, in barns, sheds, the shelter of piazzas and other similar situations. It is about seven inches long, dark above and white below, tinged with yellow. Its bill is black. It is sometimes called pewee, but that name is better reserved for the wood-pewee. It winters north of the frost-line. It owes its name to its song of *pewit-phœbe*. See PEWEE.

Phœ'bus ("the bright"), an epithet and afterwards a name of Apollo. It had reference to the youthful beauty of the god and to the radiance of the sun when, at a later period, Apollo became identified with Helios the sun-god.

Phœnicia (*fē-nĭs'ĭ-a*) a territory on the eastern coast of the Mediterranean, north of Judea. The boundary lines differed at different times, but its length generally was about 200 miles and its average width about 20 miles. It is impossible to say when the first Phœnician settlers entered the country; but it is generally conceded that they came, not from one region, but from several different directions, and that they grew into one nationality very slowly. The history covers nearly 2,000 years; and, although our sources of information are meager, it may be divided into four distinct periods. The first of these comprises the immigration and gradual development of the tribes until the historical time when Sidon began to take the lead about 1,500 B. C. The second period dates from the conquest of Palestine by the Hebrews, when Sidon had already become the "first born of Canaan", as recorded in *Genesis*. The flourishing state of commerce and manufactures is seen from many passages in Homer. The gradual ascendency of the rival city of Tyre marks the beginning of the third period, in which Phœnicia attained her greatest power and glory, her ships covering every sea and her commerce extending far and wide. During the reigns of David and Solomon (980-917 B. C.) friendly relations existed between the Israelites and the Phœnicians under Hiram king of Tyre. As each country needed what the other could supply, a close alliance was formed, between Hiram and Solomon especially, Hiram furnishing a portion of the material for Solomon's temple. By this time, too, the Phœnicians had not only planted colonies on the coasts and islands of the Ægean and Mediterranean Seas, but had passed through the Strait of Gibraltar and established themselves on the western coast of Spain and of Africa, while their alliance with the Hebrews permitted them to find their way to the Indies by the Red Sea. Although at first they traded in the wares of Egypt and Assyria, they soon became manufacturers on an extensive scale. Their two chief manufactures were glass (*q. v.*) and the purple dye obtained from a shellfish of the Mediterranean. Purple was one of the most noted luxuries of ancient times — especially in Asia. In temples and palaces purple garments, hangings, curtains and veils were used extensively; and in Susa alone Alexander the Great found a store of purple worth 5,000 talents. Sidon's principal production was glass — invented there by accident, it was said; but most probably the invention came from Egypt. The mining operations of the Phœnicians were extensive, and they well-understood how to work metals. The description of mining in *Job xxviii. 1-11*, must have been derived from a sight of Phœnician mining. The art of pounding bronze had certainly reached a high degree of perfection to enable Hiram to execute such works for Solomon's temple as are described in the Bible. Hiram's reign seems to have been the beginning of the end of Phœnicia's prosperity and glory. He was succeeded by his son Baleastartus, who died after a reign of seven years, and a long series of political calamities and civil wars then ensued. The fourth and last period of Phœnician history may be dated from the middle of the 8th century B. C., when Shalmaneser, king of Assyria, besieged Tyre for five years without being able to take it. Peace was concluded on terms favorable to Tyre; but two centuries later Phœnicia was conquered by Assyria. She was afterwards conquered by Nebuchadrezzar, and remained subject to Babylon until the capture of that city by Cyrus the Great, when she became a part of the Medo-Persian empire. When Persia was conquered by Alexander the Great, the last shadow of Phœnicia's independence passed away. Since 65 B. C the Phœnician territory has been a part of Syria. The religion of the Phœnicians was like that of all ancient Semitic religions—except that of the Hebrews — a kind of pantheistic worship of nature, their two principal deities being Baal and Astarte. See Rawlinson's *History of Phœnicia*.

Phœ'nix, the name of a mythical Egyptian bird, which is said to have burned itself, when a new phœnix arose out of its ashes.

Phœnix, Ariz., a city, the county-seat of Maricopa County and the capital of the state, situated on the Santa Fé., Prescott and Phœnix and Maricopa and Phœnix railroads, in the south-central part of the territory. It was settled in 1870 and incorporated in 1881. It is in a mining region with good farm-land in the valleys, in which are extensive olive-groves, and controls a large trade in live-stock, grain, hay, honey, olives, oranges and other fruits. The chief industrial interests are the stock-yards, machine-shops and jobbing houses. Among the public buildings are the capitol, agricultural experiment-station, insane asylum, court-house, city-hall, churches and schools. It is provided with good schools, both public and private. An Indian school here deserves special mention. It has more than 400 students, and, besides its regular course of instruction, has departments that teach manual training. Government is vested in a mayor, who holds office for two years, and a council. Population 50,000.

Phœnixville, Pa., a borough in Chester County, at the confluence of Schuylkill River and French Creek, 23 miles from Philadelphia. It manufactures silk, cotton goods, hosiery and matches, but of greatest importance is its iron industry. It contains rolling-mills, blast-furnaces, bridge-works and iron-mills, including one of the largest plants in the country. Phœnixville has good schools, a public library, a park and a hospital. The waterworks are owned and operated by the borough, and it has the service of two railroads. Population 10,743.

Phonet′ics, the science of the sounds of the human voice. Sound is produced by the expulsion of air from the lungs through the windpipe. When this air in its passage through the throat sets the vocal cords in vibration, voice is produced. After passing through the throat the voice enters the mouth or nose or both. As a practical science, phonetics comprehends not only a knowledge of the sounds uttered in human speech, but the invention or discovery of an alphabetical symbol to represent each. The sounds are of two kinds: Fixed sounds, where the cavities of the mouth remain unchanged during the passage of the air; and glides, where these cavities are constantly changing or, in other words, where the utterance is variously modified by the tongue, palate, lips and teeth. The former sounds are called *vowels*, and in English are represented by the letters, *a, e, i, o, u, y;* the latter sounds are called consonants, that is, with-sounders, as they are sounded with the vowels, but not alone. The great variations in spelling and pronouncing English have long been a source of perplexity to foreigners learning our language, and have caused many "phonetic reformers" to arise, with plans for producing uniformity; but none of these has ever been adopted, except in the case of a few words. Perhaps the reason of this is that, however "irregular" may be the spelling of so many words, yet the forms in which they are written have become as firmly fixed in our mental habit as are the sounds they represent and the ideas conveyed by those sounds; hence we can never consent to any changes, except those that are gradual and proceed as by a growth. Another difficulty in the phonetic reform would be that, even if it were possible to devise a fixed alphabetical symbol for every sound or combination of sounds, to which all good writers would conform, the pronunciation of words would at once begin to vary and in time our spelling and pronunciation might be as "irregular" as now.

Pho′nograph. "Mama," said the little girl "you have such beautiful tunes in your voice!"

But how do tunes get into the voice? Let's see. Sounds (*q. v.*), songs, for example—vibrate the tympanum of the ear (*q. v.*) just as they vibrate the diaphragm of the telephone (*q. v.*), and these sounds are recorded in the brain cells. Then, when you want to sing these songs again, you set your brain "going" by thinking about them and this makes your vocal cords vibrate, just as the tympanum of your ear did, when you first heard the songs and so you reproduce both the words and the tune.

Now, just as the telephone is, broadly speaking, a mechanical ear, the camera (*q. v.*) a mechanical eye, the phonograph is a mechanical brain. Sound, vibrating a diaphram with a needle attached to it, causes this needle to record these vibrations, by indentations, on a cylinder, as in phonographs used in business offices, or on a disc, as in musical phonographs.

In business houses money and time are saved by dictating to a phonograph instead of to a stenographer. The typewriter operator simply takes the cylinder on which the dictated letter is recorded, puts it in another phonograph on her own desk and writes down the letters which have been dictated to it and which it redictates to her.

While the business phonograph is thus a great time saver, the musical phonograph shares with the piano player a great and beautiful service to humanity in the cheapening and diffusing of music comparable to the service of the printing press in diffusing art and literature. The phonograph is also successfully used to make moving pictures "talk," both the moving picture machine and the phonograph being controlled by an electric motor which, as Hamlet (A3; S2) says, "suits the action to the word, the word to the action."

It was Mr. Edison (*q. v.*), who in 1877, patented the phonograph. In 1915 he patented a device for recording telephone conversations, the principle of which is described under TELEPHONE, Page 1885.

Phonog′raphy. See SHORTHAND.

Phonom′eter is an instrument of Edison's invention for testing the force of the human voice in speaking. It consists chiefly of a mouthpiece and diaphragm, behind the latter of which is placed a delicate mechanism which operates a 15-inch fly-wheel by means of which a hole can be bored in an ordinary pine board.

Phonophore (*fō′nô-fōr*), is a device of Langdon Davies of London, England, for transmitting electric signals through circuits which are not closed. Messages have been sent over wires open at both ends, in circumstances which would render ordinary telegraphing impossible. The same wire has been used at once for ordinary telegraphing and for the transmission of phonophore signals. When, the resistance having been greatly increased, the ordinary signals ceased, those of the phonophore continued as distinct as before. The transmitter is fitted with a vibrating reed at one end and the receiver with a stretched steel band at the other, which can be tuned to the same note.

Phos′phates, salts formed from the phosphoric acids, are of great importance in plant and animal life. Phosphate of soda, in any of its three forms, may be dissolved in water, and is found in all the soft and fluid portions of the bodies of animals. Phosphates abound especially in the blood and tissues of carnivorous animals. They are necessary to the process by which cellular tissue is built up from the blood. Phosphate of lime is not only needed in the bodies of animals, but when properly prepared it is a valuable manure for plants. In animals it forms four fifths of the enamel of the teeth and more than half the substance of the bones. Normal phosphate of lime or normal calcium phosphate is indeed insoluble; but in the fluids of the animal body it is held in solution as a loose compound with albumen etc. As calcium phosphate is necessary to a fertile soil, bone-dust and mineral phosphates of calcium are sold commercially as fertilizers. Bones have for many years been an important form of phosphate manure. They generally are first boiled or steamed. Bone-phosphates, being slow-acting fertilizers, should be used finely ground and as a permanent benefit to the soil rather than as direct plant-food. Phosphates associated with organic matter decompose more quickly than purely mineral phosphates do. They therefore are more readily available fertilizers. Great deposits of lime-phosphates are found in Alabama (*q. v.*), Florida, South Carolina and Tennessee. See FERTILIZERS and PHOSPHORUS.

Phosphorescence (*fŏs′fŏr-ĕs′sens*). When a body emits light because it has been raised to a high temperature, we describe the phenomenon by the name *incandescence;* but when a body emits light without being raised to a correspondingly high temperature, the process is called *luminescence.* A piece of sugar cut in the dark will emit a faint light; this is an example of luminescence. A solution of sulphate of quinine held in ultraviolet light will emit a faint blue light; this is another example of luminescence, which is generally known as *fluorescence.* The Germans call it *photoluminescence,* because it is an effect produced by light. Red ink, when made of eosin, behaves in the same way as quinine. But as soon as the illumination ceases, these bodies cease to give off their fluorescent light. There are other bodies, however, as sulphides of barium, calcium and strontium, which continue to exhibit fluorescence even after illumination has ceased. This phenomenon of persistent fluorescence is called *phosphorescence.* Becquerel has proved that most bodies exhibit phosphorescence, but only for a very short time after illumination. The student should carefully note that the glow exhibited by phosphorus in the dark is due to slow oxidation, and is not a case of phosphorescence at all. Properly classified, it is a case of *chemical* luminescence.

Phos′phorus, one of the nonmetallic elements. At ordinary temperatures it is an almost colorless or faintly yellow, solid substance, having the glistening appearance and consistency of wax. If it be heated to 140°F. in the air, it catches fire and burns with a brilliant white flame. It is so inflammable as to burn by mere friction at ordinary temperatures. Even the warmth of the hand may set it to burning. In experiments care must be taken lest the hands be severely burned. It is kept in water lest it may spontaneously get on fire. It shines in the dark, from the slow combustion it undergoes. Taken internally, it is a powerful irritant poison. Persons engaged in the manufacture of matches are frequently seriously affected by its fumes. Scientists have overcome this danger to some extent by the discovery of red phosphorus, which is prepared from ordinary phosphorus by heating it in a closed iron vessel. Phosphorus is not found in an uncombined state in nature. It was first discovered by Brandt in 1669. Bones at present furnish a large part of the phosphorus of commerce. Bones are burned to whiteness and powdered, then mixed with sulphuric acid to decompose the phosphate of lime in the ash; the solution of the superphosphate is evaporated to a syrup, mixed with charcoal and distilled; then the phosphorus rises in vapor and is condensed. The mineral apatite is also used instead of bones. See PHOSPHATES.

Photius (*fō′shĭ-ŭs*), (A. D. 820-91), a patriarch at Constantinople, whose chief distinction is his influence in bringing about the separation between the Latin and the Greek church. The separation did not completely take place during his time, but its beginning did. Steps were taken under his leadership which could not be retraced. A council in 867 raised a controversy of doctrine and discipline between the churches of the east and west. The east withdrew from the west. Another council condemned the western church. Some time after this the separation was completed.

Pho'to-Engrav'ing is a process for the conversion of a photograph into an engraving, from which engraving prints may be taken by any good printing-press. Such perfection has been reached that photo-engravings have largely replaced wood-engravings for illustrating books and newspapers. One of the best, if not most of the processes in use to-day, will be found based upon discoveries in the early part of the 19th century that asphaltum, when it has been subjected to the action of light, is no longer soluble in its ordinary solvents. A plate therefore coated with asphaltum which has been exposed in the camera obscura to light and shade would possess a surface, part of which was soluble and part insoluble. By the application of biting acids, these plates are then chemically etched. This process is especially useful to reproduce line-engravings or the pen-and-ink sketches used so freely in the daily papers which are now rapidly produced by chemical processes. Many of the variations in the ordinary process are kept secret, and others could hardly be explained to any other than an expert.

Photog'raphy. The art of making pictures by the direct action of light on a sensitive surface dates from the beginning of the 19th century. The action of light on certain salts of silver was studied by Scheele, a Swedish chemist, in 1777, who laid the foundation for the work which followed. He found that certain of the salts were blackened by exposure to light, the effect being due largely to the blue and violet rays in the spectrum. It was an easy step to coat paper with this sensitive substance and obtain impressions of leaves, ferns and similar objects by the action of sunlight; but no way was known of rendering the pictures permanent and they attracted no great amount of attention. In 1839 a Frenchman named Daguerre succeeded in producing a sensitive surface on a copper plate which was so rapidly affected by light that impressions could be made on it in the camera, which impressions could be made permanent. The process at once met with great favor, and, owing to its comparative cheapness, almost immediately supplanted miniature painting, which was then in vogue. The disadvantages of Daguerre's process were manifold. Very long exposures were required, a sitting was required for each picture, and the picture had to be held in a certain light to be seen.

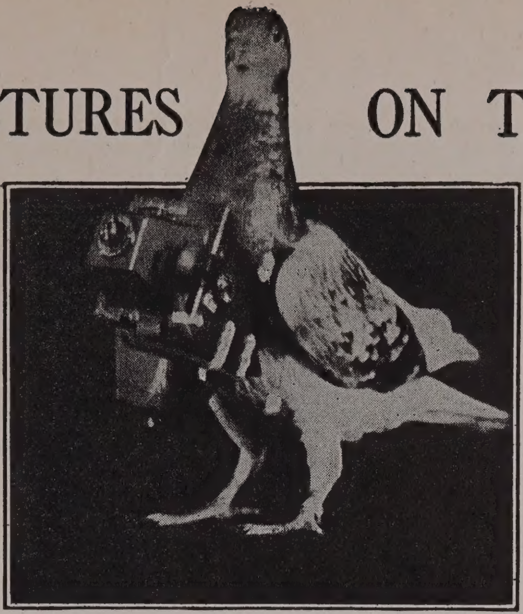
The next step was the invention of the collodion plate, which shortened the time of exposure, and furnished the means of producing any number of pictures from a single plate. It was necessary to use these plates in a wet condition, however, and their employment was consequently limited to the studio. The discovery of the dry plate, which is in use at the present time, was made about a quarter of a century ago and was the means of bringing the art within the reach of everybody. Before the days of dry plates the photographer was obliged to carry about with him a portable dark room, for the plates had to be immersed in a bath of silver nitrate immediately before exposure, and the development could not be postponed a moment after exposure.

The present dry-plate process is essentially as follows: Glass plates are coated with a film of gelatine containing a mixture of bromide and iodide of silver. After exposure in the camera they are developed by means of suitable chemicals in a room illuminated only with red light. The action of the light on the plate is to start a reaction in the silver salt which requires the action of the developer to complete it. This reaction is the transformation of the white bromide of silver into black metallic silver. The plate after development consequently appears black wherever the light has acted on it, the resulting picture being called a negative, since the high lights are black and the deep shadows white. After development the plate is transferred to a bath of hyposulphite of soda, which dissolves the unaffected silver-salts leaving the gelatine quite transparent except for the black deposit which forms the picture. From this negative any number of pictures can be printed by exposing sheets of sensitized paper under it to the action of sunlight. The black deposit of silver in the film screens the paper from the blackening action of the light; consequently the resulting print is white in those places which, in the negative, are dark, and the picture is a positive. Modern plates are made so sensitive that it is possible to secure pictures of objects in sunlight in the 1-1,000 part of a second. The plates of Daguerre required an exposure of from five to 15 minutes.

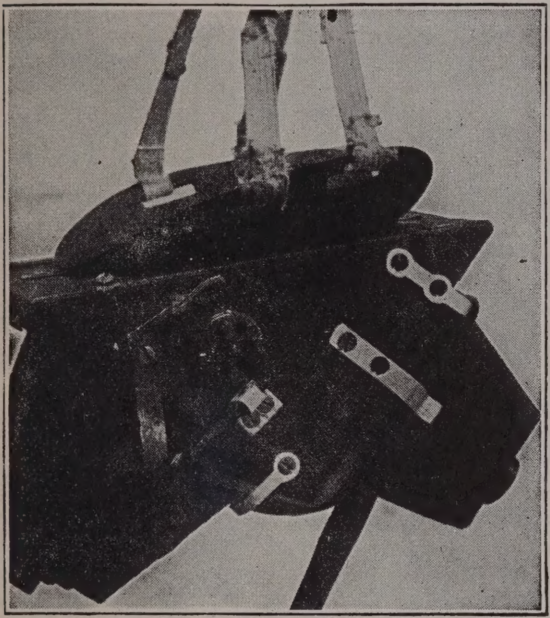
Since the introduction of these extremely sensitive plates photography has proved of the greatest aid in scientific investigations. In astronomy clusters of stars and nebulæ have been photographed, which no eye can see, even in the most powerful telescopes for the photographic plate can be exposed for hours to the image, the action of the feeble light accumulating in the sensitive film, whereas in the eye, if the light is too feeble at once to affect the retina, prolonged gazing is wholly without effect.

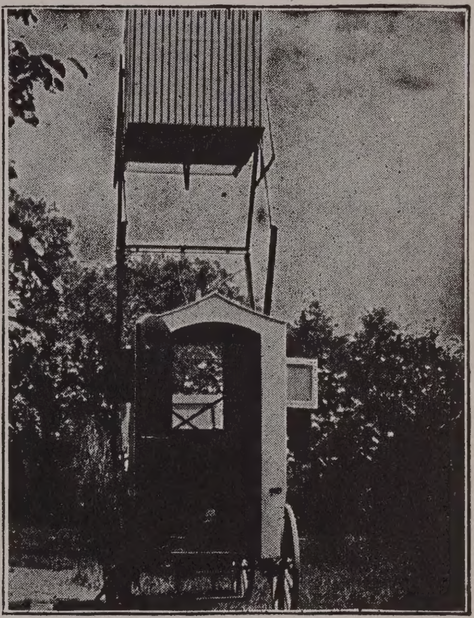
By employing the light of the electric spark, rapidly moving objects can be photographed in as brief an interval as the millionth part of a second. In this way beautiful pictures of flying rifle-balls, with the ripples and waves of air which accompany them and the boiling wake which follows them, have been secured by Professor Boys of London. Professor Wood of the University of Wisconsin had in a similar manner secured pictures of sound-waves

TAKES PICTURES ON THE WING

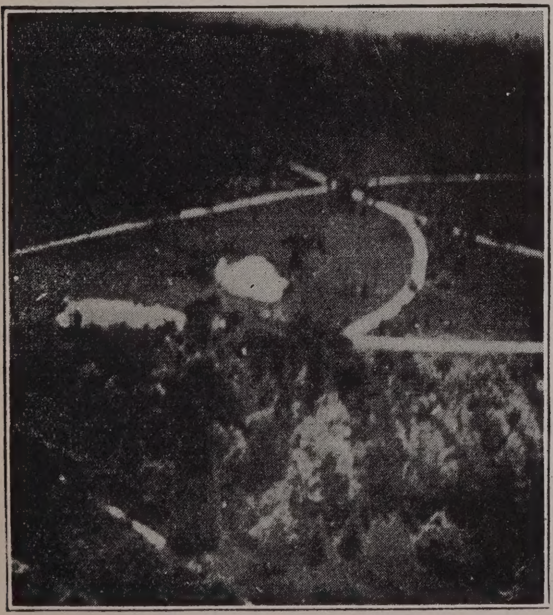


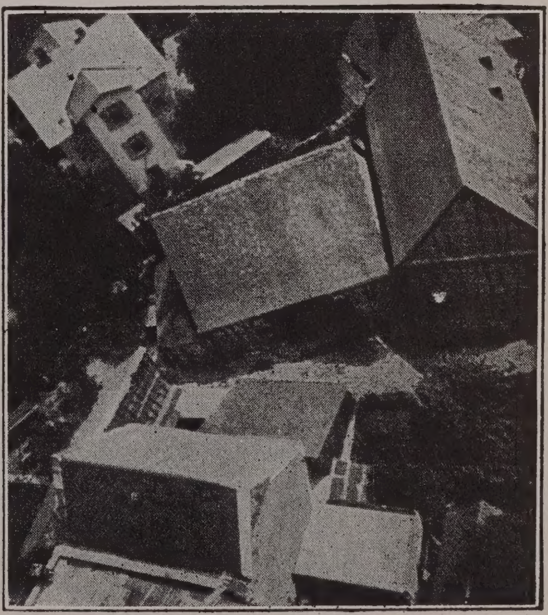
IN Germany carrier pigeons have been used to get "birdseye" views with cameras. The camera is strapped to the bird's breast, and is made so that it points downward when the little photographer is on the wing and catches whatever he may be passing over when the film is exposed. An automatic (self-working) device, wound up like a watch, exposes a new film at regular intervals. From the two examples given at the bottom of this page you can see how the world looks to a bird or to a man in a flying machine.





This shows how the camera is strapped to the breast of the feathered artist. On the right is the dovecote on wheels. His owner sleeps below.





Here are views of a park and a portion of a village taken by "Pigeon Photography."

in air, the image of the spherical wave of condensed air being impressed on the photographic plate by the light of an electric spark occurring at just the right moment. By means of cameras fitted with electric lights, which have been lowered into the sea, pictures of the ocean's bottom, with the sea-plants and coral formations, have been taken. Swung from the tails of kites, cameras, operated by an electric current sent up the wire kite-string, give us pictures of our surroundings as they appear from an elevation of a mile or two.

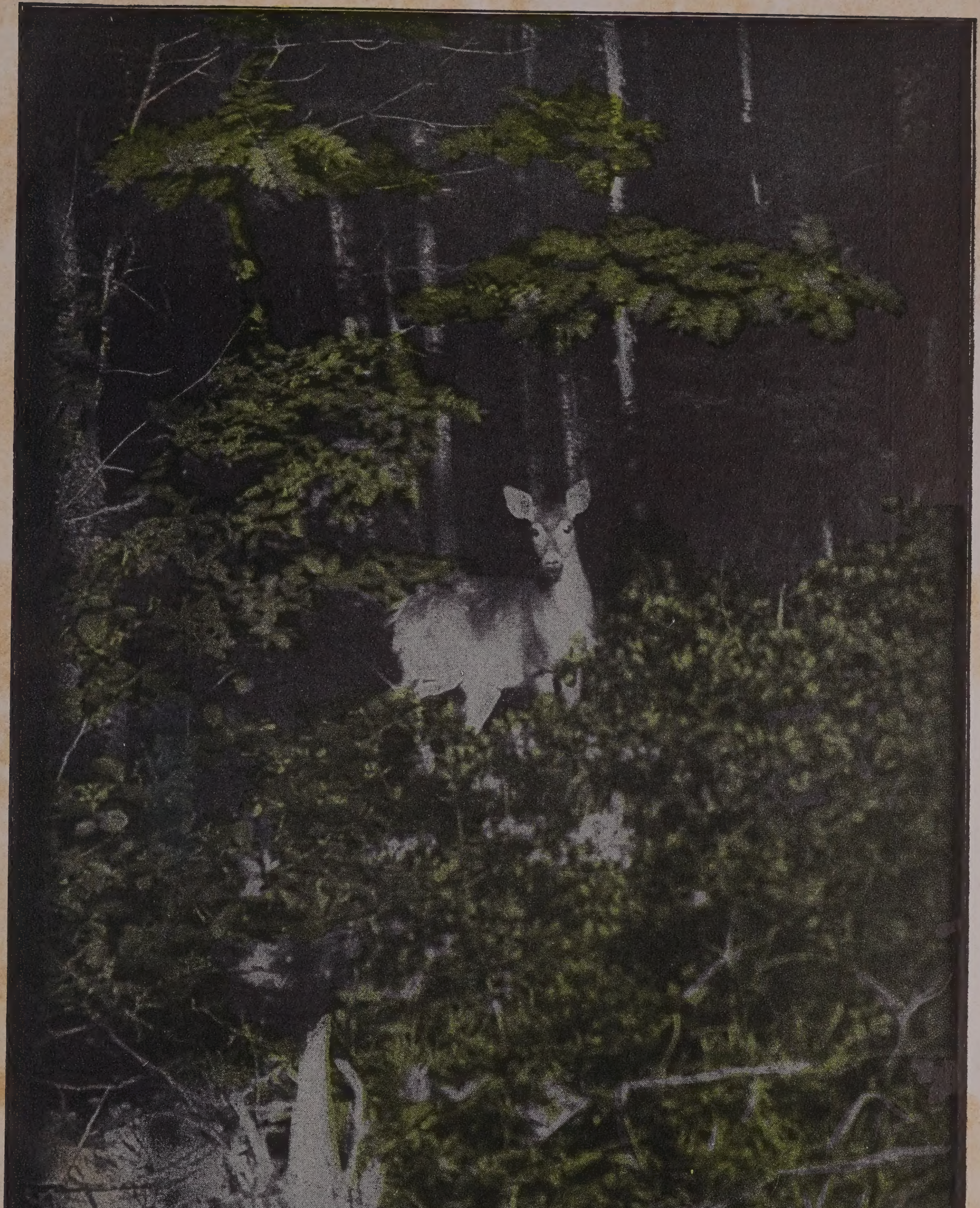
Book and magazine illustration is now done largely by photography, the old-fashioned woodcut having been driven out by the zinc plate, which is engraved or etched by a photographic process, giving an absolute fac-simile of the original drawing. One of the most remarkable developments within the last ten years has been the production of plates which are sensitive to all the colors of the spectrum. The ordinary commercial plates are sensitive only to the blue and violet parts of the spectrum, consequently red or yellow objects always come out black in the finished picture. Vogel of Berlin discovered, however, that if the plates were slightly stained with some aniline dye capable of absorbing the red and yellow light, they at once became sensitive to these colors; consequently such plates could be used for photographing colored objects, where it was essential that correct color-values should be rendered. Plates are now made which will blacken in the light of the ordinary dark-room's red lamp almost as quickly as ordinary plates in candle light. Such plates are called arthochromatic plates, and they are used for photographing paintings and other colored objects as well as in many of the processes of color photography. Great improvements have been made also in photographic lenses within the past quarter of a century, the firm of Zeiss in Jena having been most active in the development of the modern photographic objective.

It is impossible to predict what the future has in store for photography. Still more sensitive plates would be of immense use, particularly in scientific photography, and it is not by any means impossible that some new discovery may at any time give us a plate ten times as rapid as the present one. What is most desired, however, is some satisfactory color-process, which can hardly be expected until some one is fortunate to discover that unknown chemical which has the property of assuming a color similar in hue to the color of the light which illuminates it, and *retaining that color permanently*, a discovery which there is no immediate promise.

Color Photography

At the very beginning of the art of photography it was observed that traces of color sometimes appeared in the picture which bore some resemblance to the color of the light acting on the plate. Photographs of the solar spectrum were obtained in this way at the beginning of the last century, in which the colors were reproduced with more or less fidelity, but no method was discovered of rendering the colors permanent, and it is only within the last few years that satisfactory methods have been devised of producing colored pictures by the aid of photography. The methods in use at the present time may be divided into two classes: The direct, in which the color is produced by the action of the light, and the indirect, in which the color is applied subsequent to the taking of the picture, the photographic process being modified so as to cause the colors to distribute themselves properly in the finished picture.

The only successful process of the first class is that of Lippmann, the French physicist, whose method was carefully worked out by theory before a single experiment was tried. Lippmann's process essentially is as follows: A photographic plate is placed in a holder with the glass-side toward the lens of the camera, and mercury is poured into the back of the holder, forming a metallic mirror in contact with the sensitive surface of the plate. The light after passing through the film is reflected back through the film in the opposite direction by the quicksilver mirror. A very remarkable thing now takes place. The reflected light-waves from the mirror interfere with the oncoming waves, producing what are known as stationary waves in the sensitive film. Now, while ordinary light-waves deposit the silver in the film in a solid mass, the stationary waves have the singular power of depositing it in exceedingly thin laminæ of films, each one thinner than the thinnest gold leaf. The thickness of the silver laminæ varies with the color of the light producing them, red light or long waves producing thicker films than blue light or short waves. Thin films, we know, show brilliant colors by reflected light, the commonest example being the soap-bubble, and the silver laminæ in Lippmann's pictures show color in exactly the same way. The color of any part of the bubble depends on the thickness of the soap-film, and in the same way the color of any portion of the photograph depends on the thickness of the silver-films deposited by the light-waves in that place. The curious thing about the process is that light of any given color will deposit films of just the right thickness to show the same color by reflected light after the plate is developed and fixed in the usual manner. What is still more remarkable is that this fact was recognized by the inventor of the process before any of his experimental work was done The production of pictures



Courtesy of Doubleday, Page & Co.

DEER TAKEN BY FLASHLIGHT

OTTER

Courtesy of Doubleday, Page & Co.

PORCUPINE

by this method has thus far been confined to the laboratory, the conditions for success not yet being quite fully understood. Probably not more than half a dozen people in the world have succeeded in getting satisfactory results, owing to the experimental difficulties.

Of the indirect processes there are a number which have been developed far enough to be considered commercial successes. These processes are all based on the principle that any color can be imitated by a mixture of the three primary colors, red, green and blue. The most beautiful results have been obtained by Mr. Ives of Philadelphia, one of the pioneers in this line of work, whose process consists, briefly, in taking three negatives of the subject through red, green and blue glasses. These glasses prevent light of any other color than that which they are designed to transmit from getting at the plate; consequently each negative is a record of the distribution of one of the three primary colors in the original. From these negatives three transparencies on glass are printed, which, when thrown superimposed on a screen by means of three lanterns furnished with colored glasses similar to the ones used in taking the pictures, combine to form a very perfect reproduction of the original.

For exhibiting the pictures without the lanterns Mr Ives has devised an instrument which he has named the kromskop, in which the colored images are combined by reflectors. The pictures are stereoscopic as well, and the result is a reproduction so perfect that it is almost impossible to believe that we are not looking at the object itself, for it stands out in full perspective with every color perfect.

Another process, which was perfected independently and almost simultaneously by Dr. Joly of Edinburgh and Mr. McDonough of Chicago has been recently put upon a commercial basis. In this process the negative is taken on a plate in front of which is placed a screen ruled with very fine lines in red, green and blue ink, the colors following each other in succession across the screen. This screen breaks up the picture into linear strips, any one of which may be regarded as a record of one of the three primary colors along that portion of the picture. From the negative obtained in this way a positive is printed on glass, which, when mounted in contact with a similar tricolor ruled screen, reproduces the colors of the original. The objection to this method is the obtrusiveness of the lines, especially when the pictures are projected. The colors are much weaker and less faithfully reproduced than by the kromskop method.

Another method, devised originally by Prof. N. W. Wood and recently improved and perfected by Mr. Ives and his son, employs the diffraction grating as the source of color in the picture. The pictures can be duplicated by a purely mechanical process, but are colorless except when examined with a special viewing apparatus. Results have been obtained by this method very nearly if not quite equal to those yielded by the kromskop. The most recent process, and the only one which appears to have been a commercial success, is the recently devised starch-grain process invented by the Lumiere brothers of Lyons. It is a modification of the Joly process, the colored lines being replaced by stained granules of potato-starch. The plates are not very difficult to operate, and the results are highly satisfactory, though by no means equalling those yielded by the kromskop method. R. W. Wood.

Pho’tograv’ure. The expense of photogravure work greatly limits its use mostly to high-class bookwork. Large pictures, however, are produced by it which rival the finest steel engraving in finish and delicacy. The photographs can be reproduced, but the process is largely employed for obtaining engravings, such as copies of celebrated pictures. The process is so nearly perfect that any touch of the painter’s brush is clearly seen in the copy. We here give one of the methods. (See Photography for sensitized plates, negative etc.) A gelatine relief is obtained by exposing bichromated gelatine to the action of light beneath a negative. The gelatine is mixed with a quantity of black lead in more or less granular form. This causes the relief to have a surface which is granular in character, and also makes it a conducting one for electricity. Put now into an electrotype bath; it will soon be covered with a deposit of copper. A copper printing-plate is thus made, from which pictures are printed.

Pho’tophone, a curious instrument invented by Graham Bell in 1880. It is based upon the fact, discovered by J. E. Mayhew in 1873, that the resistance of annealed selenium is less in sunlight than in the dark. Using a piece of thin, silvered glass on a diaphragm, Bell was able, by means of the human voice, so to deflect a pencil of sunlight that, with each pulsation of the voice, a distant piece of selenium was alternately illuminated and left in the dark. This piece of selenium was in the circuit of a telephone receiver and a battery. At each illumination a sudden increase of current passed through the receiver, because the resistance of the selenium was diminished. One with his ear at the receiver, therefore, heard every pulsation of the voice that deflected the sunbeam upon the selenium. Such an instrument he called a photophone.

Photosyntax (*fō’tō-sĭn’tăks*), a term formerly used for photosynthesis.

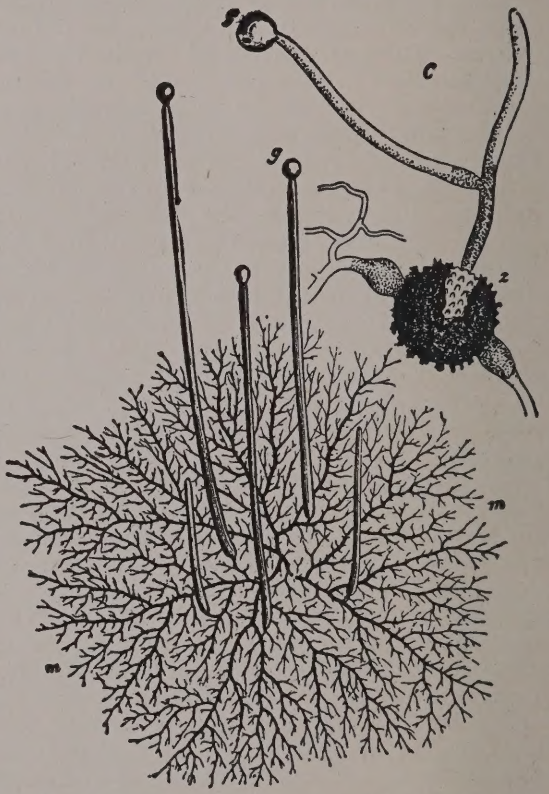
Photosynthesis (*fō'tŏ-sĭn'thĕ-sĭs*), the process by which green plants make sugar, starch and similar food. The materials for this are carbon dioxide and water. The former is obtained chiefly (if not exclusively) by the leaves and twigs from the air, where it constitutes three parts in 10,000. It passes through the stomata by diffusion, dissolves in the water, saturating the cell-walls, and so enters the cells. The organs by which the food is made are the minute, green bodies called chloroplasts or chlorophyll bodies, which give the plant its color. They are composed of protoplasm, which holds a green dye, chlorophyll, and are imbedded in the colorless protoplasm of those cells which lie near the surface of a plant. The chlorophyll absorbs some of the light, especially the red and yellow parts, and this energy is used (how is unknown) in the process of food-making. Even twilight (not moonlight) suffices for some photosynthesis; the amount of food made is proportional, other things being equal, to the brightness of the light. The details of the process are not known. Usually a sugar appears as the end product; this increases to a certain amount in the water of the cell; some of it is turned into starch, minute granules being formed in the chloroplasts. The food is constantly being carried away to places of use or storage. In daylight food is usually produced more rapidly than it can be disposed of: but, as photosynthesis ceases at night, the surplus is then removed. See AËRATION, CHLOROPHYLL and STOMATA.

Phototaxis (*fō-tō-tăks'ĭs*) (in plants), the sensitiveness of an organism, free to move about, to unequal illumination (see IRRITABILITY), to which it responds by taking up a definite attitude with respect to the direction from which the brighter light acts. Only water-plants are free to respond. Diatoms, desmids, some filamentous algæ and zoöspores of algæ and fungi show these reactions. Algal zoöspores swim toward light, and fungous zoöspores swim away from it.

Phrenol'ogy In popular language phrenology may be defined as the theory of mental philosophy based on the size or the relative size of the different parts of the brain. It claims that we can localize the different parts of the brain which gives rise to different mental functions. Phrenologists make a map of the cranium, on one division writing self-esteem; on another, wit; and so on. Examining your head, the phrenologist will put his finger on one point and say: "This man has a large development of self-esteem." Moving his hand to another bump: "This man is lacking in veneration;" or "He has a great power of language;" or "He has to try hard to give exact statements;" and so on. The cultivated phrenologist thus goes through all the divisions of mental and moral qualities, finding a local boundary in the brain for each. In Britain, Gall, Spurzheim and George and Andrew Combe may be mentioned as representative phrenologists. In America the more noted ones are Dr. Charles Caldwell, the Fowler brothers and Wells.

Phryg'ia, an ancient country of Asia Minor, whose boundaries varied at different periods. It is supposed that at one time Phrygia included most of the peninsula. In general it is a high plateau which afforded pasturage for flocks. Gold was found in the mountains and streams. Vines were cultivated in some districts, and Phrygian marble was greatly prized. Phrygia was conquered by Crœsus in the 6th century and by the Persians in 549. The influence of the Phrygian religion is traced in Greek mythology.

Phycomycetes (*fi'kŏ-mī-sē'tēz*), plants forming one of the great groups of fungi, which is distinguished by being more like the algæ in structure and reproductive habits than any of the fungus groups. The name means alga-like fungi. The mycelium is composed of cœnocytic threads or hyphæ, that is, filaments which contain no partitions. (See CŒNOCYTE). It seems to be more than probable that the group has been derived from the green algæ. Prominent members of the group are Saprolegnia forms known as water-moulds because they live upon the dead bodies of water-plants



Mould, showing mycelium (*m*), young sporangia (*g*), and fertilized egg (*z*).

and animals, sometimes attacking living fish, one species being very destructive to fish in hatcheries. It is interesting to note that this group of fungi has retained the aquatic habit of the algæ. As a consequence, its asexual spores are ciliated and have the power of swimming. Another feature of the water-moulds is that the oögonium sometimes forms several eggs and that frequently the eggs form new plants without any fertilization, being an illustration of the habit called parthenogenesis (which see). The mucor forms are well-represented by the black moulds, which form white, furry growths on damp bread, manure-heaps etc. From the prostrate mycelium arise numerous erect branches, each bearing at its summit a globular sporangium containing numerous asexual spores. The mucors are isogamous (which see). The peronospora forms are the downy mildews which are common internal parasites on seed-plants, one of the most common kinds attacking grape leaves. The presence of the parasite is made known by discolored and finally deadened spots on the leaves where the tissues have been killed. The spore-bearing branches rise above the surface of the leaf, and, many of them arising near together, form little velvety patches suggesting the name downy mildew. These forms are heterogamous. See HETEROGAMY.

Phyl'loclad (in plants). See CLADOPHYLL.

Phyllodia (*fĭ-lō'dĭ-ȧ*), (in plants), petioles which resemble leaves in form and function. The most conspicuous display of phyllodia is among the acacias, especially hose of Australia. The normal leaves are pinnately compound, but for the most part they do not develop, the petiole becoming flat and doing the leaf work.

Phyllotaxy (*fĭl'lō-tăks'ȳ*). The name literally means leaf-arrangement, and has to do with the distribution of leaves upon the stem and the laws which govern it. In general, there are two types of leaf arrangement· that in which the two or more leaves are developed at the same node, giving rise to what is called the verticillate or cyclic arrangement; and that in which but a single leaf occurs at each node, giving rise to the alternate or spiral arrangement. In the case of the spiral arrangement some relations have been discovered which seem to be more curious than important. In the simplest cases the leaves occur in two vertical rows, the angular divergence between any two successive leaves being half of the circumference of the stem or 180°. This type of phyllotaxy is designated by the fraction ½, which shows the angular divergence, while the denominator indicates the number of vertical ranks. In the next higher series the leaves occur in three rows, the angular divergence between successive leaves being one third the circumference or 120°. The fraction ⅖ designates this arrangement. The next higher arrangement is the one in which there are five vertical rows, but, in order to reach a leaf standing directly over the one started from, a spiral is traced twice around the stem. The angular divergence between two successive leaves, therefore, is two fifths of the circumference or 144°, and this arrangement is designated by the fraction ⅖. It has been found that any fraction may be derived by adding the numerators and denominators of the two preceding fractions. For example, the next higher arrangement would be ⅜, which means that the angular divergence is three eighths the circumference of the stem, that is, eight leaves are passed before one is reached standing directly over the one started from, and in finding the eighth leaf a spiral has been traced three times around the stem. Such high orders of arrangement, as 5-13, 8-21 etc. are displayed in pine cones.

Phyllox'era. See GRAPE-PHYLLOXERA.

Phys'ical Ed'ucation in some schools and colleges includes the physical examination of pupils and students; their personal guidance in matters relating to health; the class instruction given in hygiene; and the teaching and supervision of muscular exercise involved in gymnastics and athletics. Physical education refers more technically to the employment of large forms of muscular movement in the education of the young for the development of organic power and efficiency and for the attainment of mental and moral qualities which depend upon muscular activities and habits. As modern life becomes more sedentary and specialized, particularly for those who live in cities, the importance of physical education increases. As the scope of modern education broadens and as educational methods become more adequate in preparing pupils for practical living, the need of physical education is more clearly recognized. This term refers in theory to the plan and benefits of muscular or motor activities in general in the education of the young and is concerned with the physiology and psychology of muscular exercise where-ever it occurs. Practically, however, physical education is directly responsible for the fundamental movments of the body not required otherwise nor sufficiently by the school or by life outside of school.

In the development of modern education it is domestic science, manual training and school excursions that have to some extent supplied the need for large neuromuscular movements; but these are by no means sufficient for all the needs of the developing child, and they are not intended or adapted primarily for general organic training. Under more primitive conditions of life in the past grown people and children maintained health and became strong, courageous and self-reliant by varied work and vigorous play mostly out-of-doors. Not only muscular but mental and moral qualities of vital worth were developed by strenuous and varied action which the conditions of life made possible and necessary. While people to-day are not required to devote as much time or strength to hard manual labor as formerly, still strong, well-trained muscles, nerves and nerve-centers which work with the muscles and are developed by them are as essential now to healthful, successful living as they were. Normal development in children does not occur without the opportunity for and incentive to a variety of activities similar in principle to those which produced health and power in former generations.

It is within the scope of physical education, then, to indicate the kind and amount of motor-activity desirable for different ages and sexes and to provide in play, games, dancing, athletics and gymnastics the activities necessary to the best development of the young and for the preservation of health and organic efficiency in adult life. It also is within the responsibility of physical education to know the biologic condition of the individual and to provide as far as is possible for the care and training made desirable by personal limitations. This personal care and training may include attention to special sense-organs, — teeth, throat and other parts of the body which may need treatment as well as corrective gymnastics for tendencies to weakness and deformity. The improved physical education of the future will provide for the logical correlation of large motor-activities with subjects and interests of the young in school and outside wherever such correlations are practicable. The material of the new physical education will be largely composed of play, dancing and games. The formal, set gymnastics which have been devised to counteract the unhygienic tendencies of modern life lack in essential educational values. They are formal, more or less artificial and lack the interest and spontaneity characteristic of more natural and satisfying forms of action. Formal gymnastics will be used as adjuncts to more spontaneous exercises, but they will be modified and reconstructed to meet the demands of modern physiology and pedagogy, and will occupy a relatively smaller space in the educational program of the future. Elements for play, dancing, and games will be supplied by historical material, folk-lore and modern adaptations of large movements which conditions may render desirable and possible.

The needs of the individual should always provide the first test of the fitness and value of these fundamental motor activities. Participation in class or group activities should not conflict with the interests of the individual pupil. Outdoor exercise is always more desirable than that which is taken in a building. But in inclement weather suitable exercise in the gymnasium often is indispensable.

The kindergarten program should provide many large bodily movements through simple games, dramatic representations and dances. The finer activities of eye and finger should be carefully limited for young children. In the first and second elementary grades the larger exercises of the kindergarten may be continued with gradually increasing complexity. At this age apparatus for the easier climbing and swinging movements may be used; children of seven and eight may advantageously be given simple marching and drill formations. In the third and fourth grades dramatic representations are less suitable, games of skill are advantageous, marching and dancing are to be continued, squad formations and gymnastic drills with and without simple apparatus are in place. In the grammar grades there should be a continuation of the former exercises with a gradual increase in the difficulty and complexity of movement. Games and exercises requiring skill should have prominent place, and in the upper grammar grades group-games become more appropriate.

Through the period of rapid growth in early adolescence boys and girls should have abundant exercise in and out of doors, but as growth is often irregular and endurance very limited, much care should be taken in individual cases to prevent excessive strain and fatigue. At the beginning of rapid growth of girls, just preceding adolescence, boys and girls should be instructed in separate classes in physical training (excepting the simple exercises given in the class-room), and a definite differentiation should be made in the exercises for the two sexes in the gymnasium and on the playground.

The conscious interest of the pupil should always be engaged as fully as possible, and, before the high school at least, this interest should be related to the external purpose or advantage of the exercise rather than to the beneficial effect upon the body.

Thomas D. Wood

Physical Sci′ence, a term used in contrast with *natural* science to denote all those sciences which deal especially with inanimate matter. This distinction between *natural* and *physical* sciences, which was explicitly suggested by Maxwell, would reserve natural science for the subjects considered under the heads of zoology, botany, paleontology, physiology, anatomy, psychology, anthropology and ethnology, all of which deal with life in some of its aspects; while among the physical sciences would be included physics, chemistry, mineralogy, geology and astronomy, etc. This classification would make biology the fundamental science of the natural group and physics the foundation of the physical group. Physical science may be defined, therefore, as that branch of learning which deals especially with energy and with inanimate matter.

It should be borne in mind by the student that *physical* and *natural* originally meant the same thing, the only difference being that the former is of Greek origin, while the latter comes from the Latin Accordingly, we still find a great diversity of usage. Lord Kelvin spoke of a certain physicist as a "distinguished naturalist." The distinction suggested by Maxwell is, however, being rapidly adopted.

The unprecedented growth of physical science during the 19th century had the effect of enormously subdividing the subject. Astronomy, which, in fact, is the simplest branch of physics, requires a peculiar set of instruments for its pursuit, and therefore, is no longer studied under the head of physics. The same is true of chemistry, which is the physics of the molecule: it has become a large subject requiring a special equipment, and is a science separate from physics. Such, however, was not the case when Robert Boyle studied physics and chemistry. In like manner geology is the *physics of the earth's crust;* but it must be studied afield as well as in a special laboratory, and, hence, is a separate and very important science. Mineralogy also deals with the physics of a special group of bodies. But these bodies are so vast in number and so enormously important in commerce that they must be studied elaborately and carefully under a special head and with a special equipment.

Turning now from the *pure* physical sciences to the *applied* physical sciences, we find them grouped under the general head of *engineering*, which in turn has already been extensively subdivided. It is the rapid advance in physical science which has made possible the vast improvements in modern civilization, somewhat in the same manner that the rapid advances in natural science have made possible a more powerful and beneficent science of medicine and have introduced into modern thought the controlling principle of evolution.

Physics (*fĭz'ĭks*), in its broad sense, is that science which deals with the properties of matter and of energy. In its narrow sense physics is defined in such a way as to exclude those properties of matter which depend upon its composition (referring them to chemistry), and those properties of matter which are exhibited only in living beings (referring them to biology). For many years, however, there has ceased to be any sharp distinction between physics and chemistry. Witness the new sciences of physical chemistry and electrochemistry. Popularly defined, physics is made up of the sciences of mechanics, heat, light, sound, electricity and magnetism. A sounder view is that which regards physics as the application of dynamics to the phenomena of sound, heat, light, electricity and magnetism. See ACOUSTICS, DYNAMICS, ELASTICITY, ELECTRICITY, HEAT, LIGHT and MAGNETISM.

Phys'iog'raphy.

SCOPE OF THE SUBJECT

This term has but recently come into use, and its meaning is not yet clearly and uniformly defined. In England physiography is regarded as the introduction to physical science in general. It is made to include the elements of physics, chemistry, astronomy, physical geography, geology and, sometimes, even certain phases of botany and zoology. In America the term has a somewhat different meaning. It is sometimes used as a synonym for physical geography, but sometimes it is defined as the science which describes and explains the physical features of the earth's surface. In this sense it is the correlative of meteorology, which treats of the atmosphere, and of oceanography, which treats of the oceans. According to early usage physical geography meant a description of the earth's physical features; but physiography does not content itself with a mere description of physical features. It attempts also to explain how existing physical features originated. This indeed is the fundamental distinction between physiography, as the term is commonly used in America, and that part of physical geography which deals with the physical features of the earth's surface. In its attempt to explain the origin of the present features of the earth's surface physiography necessarily draws, to some extent, on the past history of the earth; that is, on geology. Between physiography and geology, therefore, there is no sharp line of division. The present features of the earth are the surface expression of the geological processes which have operated in the past. The relation of physiography to geology may be likened to the relation of political geography to history. Political geography is an expression, in one form, of history. The political geography of all stages of history would, from one point of view, be a summary of history. Similarly, if the physiography of each stage of the earth's history were known, this knowledge would, from one point of view, give us the complete history of the earth.

The atmosphere is as much a part of the earth as are the rocks. The study of the atmosphere is meteorology, but physiography, even in its narrowest meaning, includes the consideration of the atmospheric forces and processes which have shaped or helped to shape the present surface of the land. This includes the movements of the air (winds), the moisture of the air, especially precipitation, the changes of temperature and the chemical changes effected, directly or indirectly, through the influence of the atmosphere. While meteorology includes the study of atmospheric movements as such, physiography, in its narrower sense, includes only the effects of those movements on that part of the earth which lies below the atmosphere. The ocean, likewise, is a part of the earth. The science which deals with the ocean as such is oceanography; but the consideration of the ocean as a part of the earth falls within the province of geology, while a consideration of the effects of oceanic activities which modify the surface of the solid part of the earth falls within the scope of physiography. Thus the effects of rivers, waves, currents etc. on the configuration of the solid part of the earth fall within the province of physiography. Physiography, therefore, concerns itself primarily with the topographic results of geologic processes. It is a special phase of geology. Since the geological processes which have left pronounced topographic results are the processes of late geological time, physiography has to do with but a brief part of the earth's history.

Physiographic Processes

Powell long ago grouped all processes that work on the earth's surface into three classes: The processes of diastrophism; the processes of vulcanism; and the processes of gradation. *Diastrophism* includes the up-and-down movements of the earth's crust, movements which, however gentle and slow, are continually in progress. *Vulcanism* includes all processes connected with volcanoes. *Gradation* includes all processes by which material is shifted from one point on the earth's surface to another. The centers of diastrophic and volcanic activity are beneath the surface. The processes of gradation are in operation on the surface, chiefly at the plane of contact between atmosphere and land and between water and the solid part of the earth beneath it. The transfer of material in gradation is usually from higher to lower levels. Thus rivers carry débris from land to sea. They *degrade* the land, and the material, deposited in the sea, *aggrades* its bottom. Glaciers likewise carry material from higher to lower levels. They degrade the places where they gather débris, and aggrade the places where they leave it. The degradation of one place generally involves the aggradation of another. The sand and dust blown by the wind constitute a partial exception to the rule that the materials shifted about on the earth's surface are transferred from higher to lower levels.

Land and Water Areas

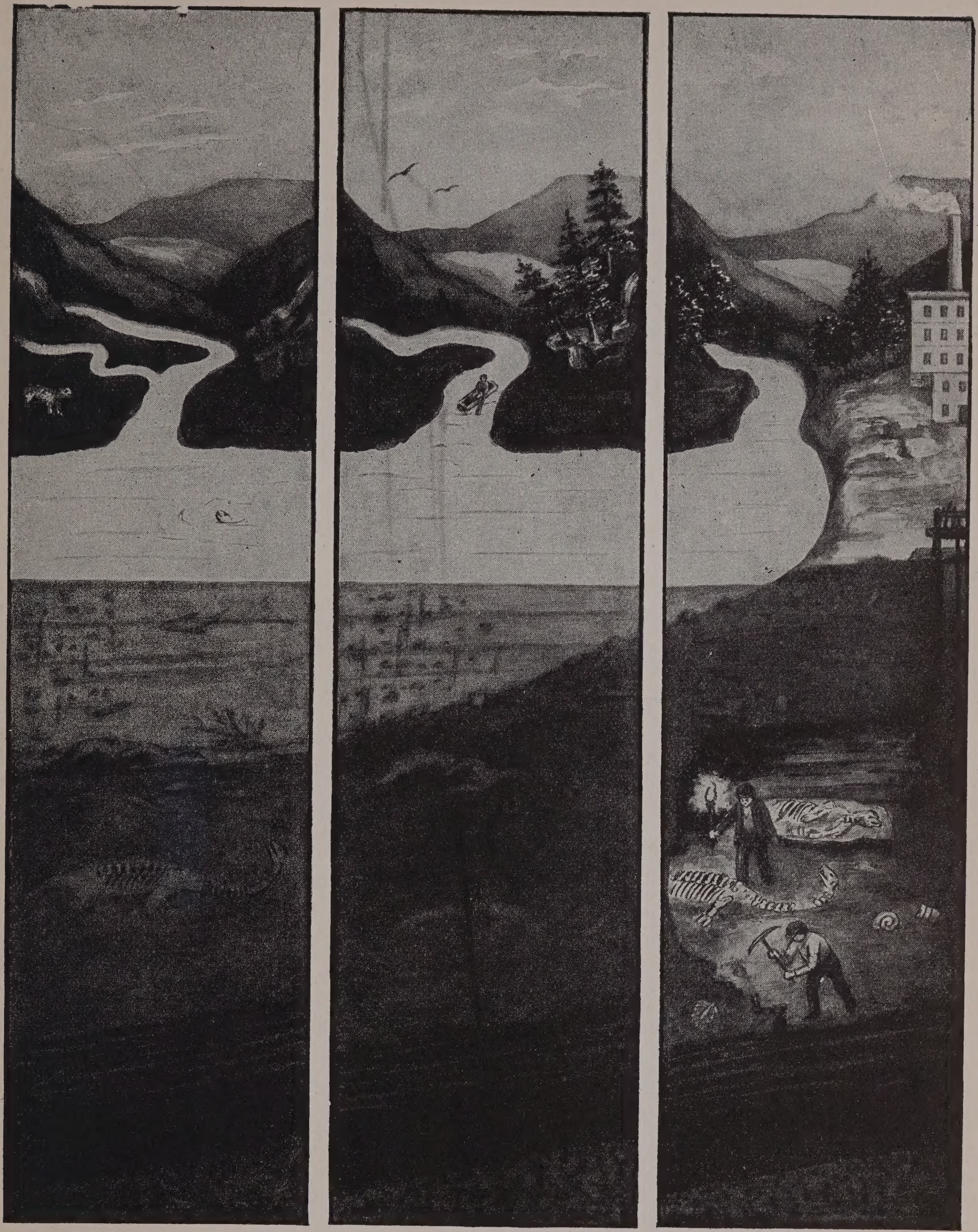
The greatest features of the earth's crust are the elevations known as continents, in contrast with the depressions known as ocean basins. The sharp, topographic division-line between continents and ocean-basins does not correspond with the borders of the continental land-areas. For a distance about the continental lands the water is very shallow. There is then a sudden descent of the bottom to much greater depths. The area beneath the shallow water is the *continental shelf.* Its outer border usually is about 100 fathoms below the level of the sea. From the physiographic point of view the outer edge of the continental shelf is the border of the continent. While the explanation of the existence of continents and ocean basins is a problem of physiography, it is an unsolved problem. No assertion can be made at the present time as to how these greatest of physical features originated. The continents have sometimes been looked on as uplifted portions of the earth's crust; but it would perhaps be quite as near the truth to consider the ocean-basins as depressed portions. It, however, is far from certain that the surface of the solid part of the earth was ever regular. If the continents were lifted or if they were left up as the result of the sinking of the ocean-basins, they are the result of diastrophism. If this was not their origin, they probably came into existence when the earth was in process of formation, whatever that process was. Smaller land-masses, that is, islands, have originated in various ways. Some are diastrophic, some are gradational (aggradational), and many are volcanic.

Physiography has to do both with the horizontal and the vertical configuration of land-areas and sea. The horizontal configuration of the one is the counterpart of the horizontal configuration of the other; but the vertical configuration of the one stands in no necessary relation to that of the other.

The Horizontal Configuration of Land Areas

It is the province of physiography to define, classify and explain the origin of all sorts of horizontal irregularities of land-areas. Among the horizontal irregularities of the land are peninsulas, capes etc. — land-masses projecting into the sea. Among the horizontal irregularities of the ocean are gulfs, bays etc. — or bodies of water projecting into the land. The sizes, positions and shapes of these irregularities are readily expressed on maps. Not so their origin. They have, indeed, originated in many different ways. For example, the uplift of an area of sea-bottom along a line at right angles to the coast of a continent, would give rise to a peninsula, like Florida. The uplift of two such peninsulas near each other might leave a gulf or bay between them. Again, the sinking of a coast allows the sea to invade the lower ends of the river-valleys, forming bays, as Delaware and Chesapeake Bays. When the sea converts the lower ends of adjacent valleys into bays, it leaves a peninsula between. Peninsulas and bays formed in this way are the results of diastrophism. Small peninsulas or capes, like Cape May,

CHANGES IN THE EARTH THROUGH LONG AGES

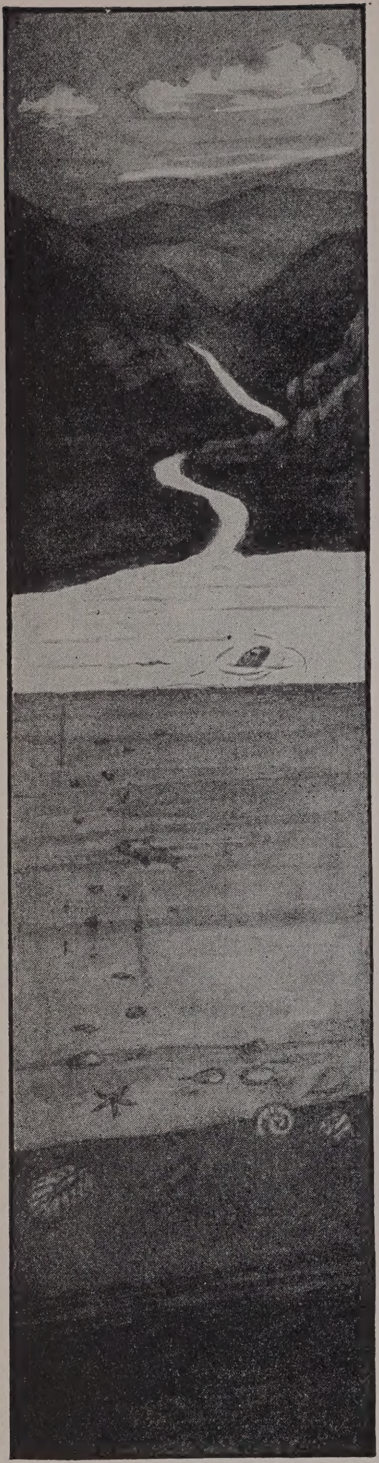


At length great animals appeared on the land. One of these died on the river's edge; its body was caught in the swollen current and carried to the sea bottom. Here it was soon buried under the shower of soil and gravel which the river kept pouring into the sea. Each layer of this material, sand, gravel and remains of animals spread on the sea bottom hardened into rock under pressure from above.

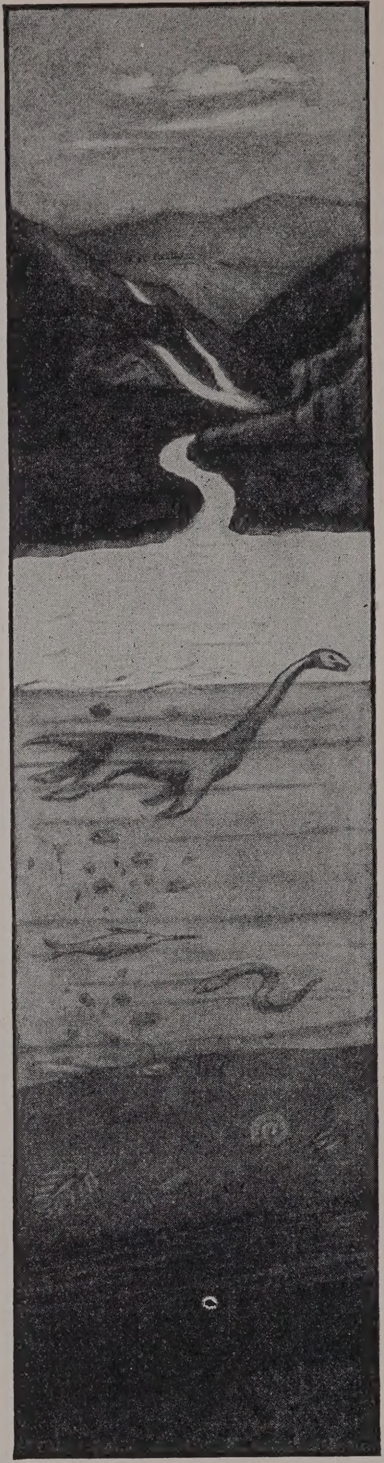
After long ages men began to live on the earth. They lived in a very crude way. They had clumsy boats made from hollow tree trunks, bows and arrows and stone hatchets. One day a man dropped his stone hatchet from his boat and it fell to the sea bottom and was buried in the mud.

The ocean bed was thus built up toward the surface, and finally became dry land. Men dug deep into the earth, and in the rocks found marks of these buried objects; the stone hatchet, the animal and vegetable remains, shells, bones of fishes, etc., in descending layers of rock, and thus read the story as we have it here.

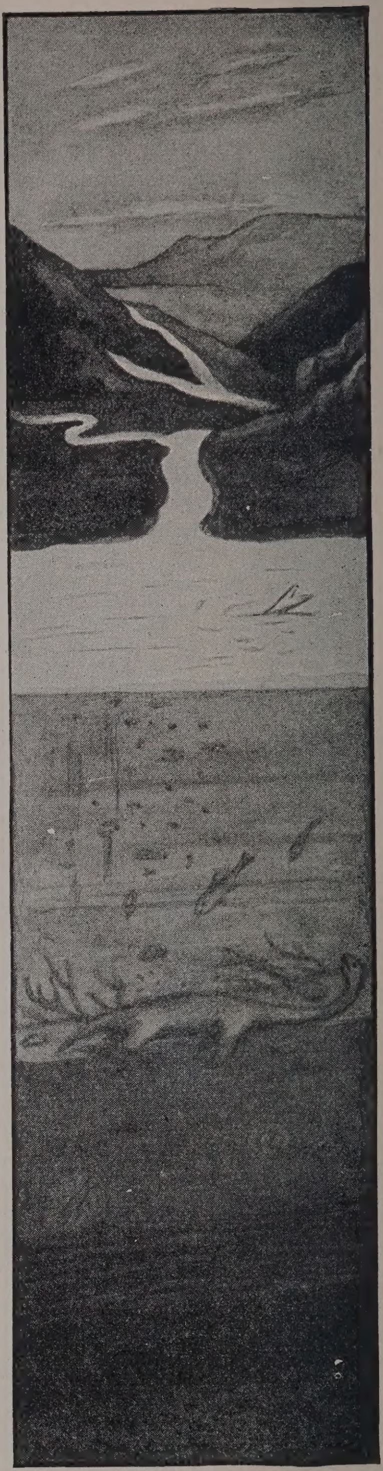
THE STORY TOLD IN THE ROCKS



The story of the earth is long. It is found recorded in the rocks. These pictures tell a part of it. You see a stream which ages ago flowed down through the mountains to the sea. Its rushing current carried sand, gravel and stones which fell to the bottom of the sea and covered up shells, bones of fish, etc., which lay on the bottom.



Later great monsters lived in the sea; some of these are shown here. The large one lifting its head above the water had a long name which means "fish lizard." As time passed the stream grew broader and washed down more stones and soil which fell into the sea covering the sea weeds, shells, bones of dead fish etc.



The great fish lizard was killed in a fight with other monsters, and its body fell to the bottom. Trees now grew on the land and dead trunks and branches fell into the sea, became water-soaked and dropped to the bottom. All these were covered up by material which was carried down by the stream, now become a great river.

may be built by deposits of sand and gravel made by waves and shore-currents. They are the result of gradation, in this case of aggradation. Glaciers moving down valleys to the sea, as in high latitudes, may gouge out the lower ends of the valleys through which they pass, cutting them down far below sea-level. When the ice melts, deep, narrow bays or *fiords*, like those of Greenland, Norway r Alaska, are the result. Such bays are . result of gradation; in this case, of degradation Volcanic activity on a coast-line may result in extending the land, — making a cape, or in destroying land which previously existed, — leaving a bay. Thus horizontal irregularities may arise by vulcanism as well as by diastrophism and gradation. Horizontal irregularities arise in many ways not here enumerated, especially by various processes of gradation; but the foregoing illustrations will suffice to show that horizontal irregularities may result from any one of the three sets of processes referred to above. The horizontal configuration of a land-area may be altered by animal or plant life, as when coral-reefs are constructed or mangrove-trees invade the water, extending the land. These may be looked on as special cases of aggradation.

Relief Features of the First Order

Physiography has also to do with the vertical configuration of the land. The great relief types are three: Plains, plateaus and mountains.

Plains are relatively low areas of considerable extent, with surfaces which are not notably rough. *Plateaus* are similar tracts of greater altitude, which stand up more or less prominently above their surroundings on one or more sides. *Mountains* usually have less areal extent, and stand up more conspicuously above their surroundings. They generally have somewhat narrow summits and steep slopes.

As topographic features, plateaus and plains may be said to differ from one another chiefly in elevation; yet there is no specific elevation above which land may not rise and yet remain a plain. Formerly, plains were often defined as lands below 1,000 feet in elevation; but this arbitrary definition has no warrant in nature or in usage. The fact is that plains often grade into plateaus and that there is no sharp line of demarkation or basis of separation which is uniformly applicable. An extensive tract of land, 500 feet above the sea, would probably be called a plain if it were surrounded or nearly surrounded by higher land, or if it were bordered by notably high land on one side and descended gradually to much lower levels on others. On the other hand, a tract of land 500 feet above the sea would probably be called a plateau if it were bordered on one or more sides by a tract of considerable extent, which had an elevation of but 100 or 200 feet, particularly if the descent to the lower level were abrupt. Extensive areas 1,000 feet or even considerably more above the sea would probably be called plains rather than plateaus, if they were surrounded or largely surrounded by higher lands, while they would be called plateaus if they stood up distinctly above their surroundings. Thus parts of the *plains* of the Mississippi basin are higher than parts of the Piedmont *plateau* lying east of the Appalachian Mountains. It is, therefore, a question of surroundings and relations, rather than actual elevation above the sea, which determines whether a tract shall be called a plain or a plateau.

A plateau may be bordered by slopes which descend abruptly on all sides or by slopes which descend gently on all sides; or a plateau may descend abruptly or gently on one side and be bordered by a higher plateau or by a mountain range on another. In the latter case the rise to the higher slopes may be abrupt or gentle. If abrupt, the separation of plateau and mountain is distinct; if gentle, the one grades into the other. If a high plateau become narrow and long, and if it descend in all directions or on both sides, it may approach a mountain range in form.

Mountains are not more sharply defined than plains and plateaus. The term mountain implies notable elevation, but a mountain is not necessarily higher than a plateau. Thus the plateau of Tibet is much higher than any part of the Appalachian mountain system. The term mountain implies (1) a considerable elevation above surroundings and (2) crests of limited area. An isolated elevation 1,000 feet above its surroundings, rising abruptly above a low flat plain, would doubtless be called a mountain, though an elevation of the same height, with gentler slopes, on a rolling plateau might not be.

It is the task of physiography to describe the forms and relations of plains, plateaus and mountains, to explain how they came into existence and how they came to assume the forms which they now have. Some plains originated by diastrophism, as by the elevation of shallow sea-bottom enough to convert it into land; others are the result of aggradation, the building up of sea-bottom slightly above the level of the sea; others are the result of the degradation of mountains and plateaus; and still others owe their origin to the combined action of diastrophic and gradational forces. Subsequent to the origin of plains, their surfaces have been modified by rain, rivers, winds, glaciers etc. It is the task of physiography to determine the nature and the extent of the changes which these several agencies have effected. Plateaus are the result of diastrophism or of vulcanism or of both. They are plains elevated to the condition of plateaus; or, less commonly, they are built up by lava-flows. After they come into existence, plateaus are subject to the same changes as plains. Mountains have originated in various ways: by diastrophism, as in the case of mountains formed by the upfolding of the superficial strata of the earth's crust or by the up-thrust of blocks of the earth's crust; by volcanoes, as in the case of volcanic peaks; and by gradation. The origin of mountains by gradation will be referred to later Like plains and plateaus mountains are modified by wind and water and air after they are formed. Physiography essays to explain how they originated and how far their present forms are the result of original uplift or upbuilding and how far the result of subsequent gradation.

MINOR RELIEF FEATURES

The great relief forms — plains, plateaus and mountains — are affected by numerous smaller relief features. Thus, a plain or a plateau may be affected by depressions (valleys) cut out by streams. Between the valleys remain elevations. If the elevations be long and narrow, they are *ridges;* if short, *hills.* The valleys are *made;* the ridges and hills are *left.* As a result of the excavation of valleys, plains may be far from flat. Generally speaking, the valleys are deep in proportion as the land is high. The valleys of plateaus, on the whole, are deeper than those of plains, and the ridges and hills between them are therefore higher. If the ridges or hills be very high, they may be called mountains. For example, the Catskills are simply the big hills left in the erosion of the plateau which once existed where the mountains now are. The depressions between the mountainous hills have been worn out by running water. It is thus that mountains originate as the result of gradational processes operating on plateaus. Special names are given to special forms of hills or mountains, developed by erosion. Here belong *buttes*, large, flat-topped, high hills developed by erosion in arid regions; *mesas*, which are more extensive remnants of plateaus; etc.

Along valley-bottoms, whether the valleys are in plains, plateaus or mountains, narrow *alluvial* plains are often developed. So, too, about the borders of lakes, whether in plains, plateaus or mountains, low, flat *lacustrine* plains of limited extent are made, either as the result of deposition in the lake or as the result of the lowering of its level or as the result of both. Lacustrine and alluvial plains are minor, secondary features in relief forms of the first order. Small plains are also developed in other ways. Along streams and lakes or along the ocean terraces are often developed. They represent other minor topographic forms developed in plains, plateaus or mountains.

Between highlands and lowlands there are always *slopes.* The slopes between mountains and plateaus are parts of the mountains and plateaus, respectively. So, too the slopes between the surface of a plateau and the bottom of a valley cut in it are parts both of the plateau and of the valley. Yet slopes constitute a somewhat distinct class of topographic forms. If slopes are very steep, and especially if they are steep and high, they are called *cliffs* Cliffs occur along sea and lake shores as well as along valleys. It is within the province of physiography to explain how these secondary and minor features, as alluvial plains, lacustrine plains terraces, slopes, cliffs etc. arose and how their individual peculiarities of form were developed.

Another topographic form is the *basin.* Basins, like most topographic types, are of various sorts. Some are large, some small. They may affect the surfaces of plains or of plateaus, or they may occur among mountains. Some have outlets, and some have not. Those which have not may give rise to lakes, ponds etc. Ponds and lakes may have outlets, but below the level of the outlet is a basin which has no outlet, else there would be no lake or pond. Other so-called basins are enclosed on three sides and open on the fourth, or at least at some one point. It is customary to speak of the great depression between the Appalachian Mountains on the east, the Rockies on the west and the Height of Land on the north as the Mississippi basin, although it is by no means completely inclosed by high land. It is the function of physiography to define the various types of basins and to explain their modes of origin and their individual characteristics.

CONFIGURATION OF THE SEA-BOTTOM

The configuration of the sea-bottom also falls within the province of physiography; and, while the sea-bottom is less familiar than the land, its general features are known. It is known, for example, that there are great areas of the sea-bottom elevated above their surroundings. Such areas are comparable, in some sense, to the plateaus on land. There are great areas where the ocean-bed is depressed, relatively to the areas just referred to. Such areas are comparable to the plains of the land. There are other depressions in the ocean-bed, more limited in area, which are comparable to basins on the land, though some of them are much larger, both in area and depth, than the inclosed basins on the land. Many parts of the ocean-basin have been affected by vulcanism. Volcanic peaks are, on the whole, more notable features of the ocean-bottom than of the land. In its fundamental features or features of the first order, therefore, the ocean-bed has some likeness to the land. But gradational agencies, especially degradational agencies, are hardly operative on the ocean-bottom, except in very shallow water. Since it is degradational agencies which produce the most notable secondary features of land-surfaces, and since these agencies are little operative in the sea, the sea-bottom, in general, is without the hills, the ridges, the mountain-peaks due to erosion, the valleys, valley-plains and terraces which abound on the land. These physiographic forms are sometimes found on the sea-bottom, and the areas where they occur are thought to have been land at one time, though now submerged. On the other hand, the shallow sea-bottom is affected by bars, reefs etc., built by waves and shore-currents, and by coral polyps. Reefs are not formed on land, and only occur there, when an area of sea-bottom is elevated to the estate of land.

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Davis' Physical Geography; Geikie's *Earth Sculpture; Physiography of the United States;* Jukes-Brown's *Physical Geology,* much of dynamic geology in any textbook on geology; those portions of textbooks on physical geography which deal with the land and with the configuration of the ocean-beds; all treatises on rivers, lakes, glaciers, as Russell's *Volcanoes,* Judd's *Physiographic Atlases of the U. S. Geological Survey,* etc.

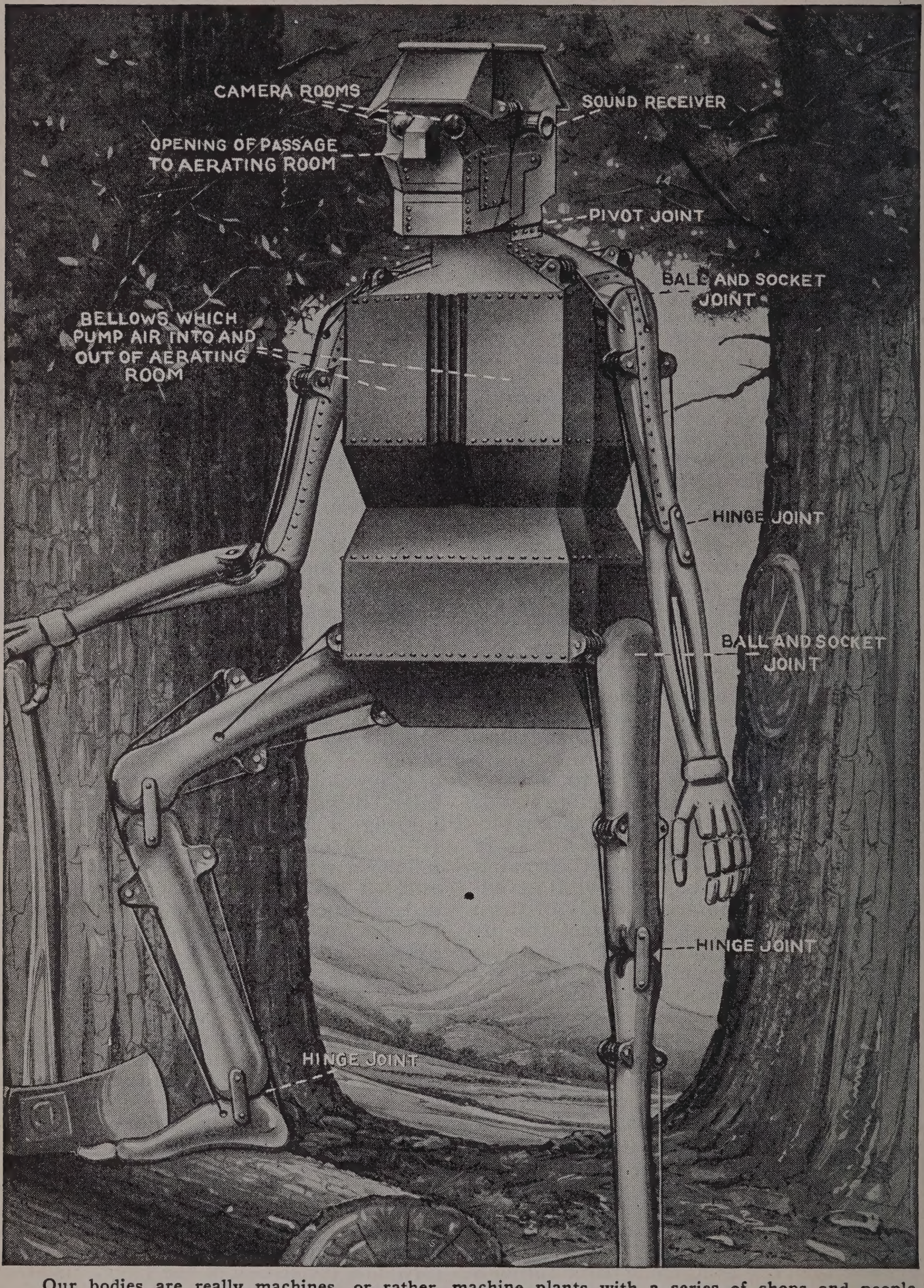
R. D. SALISBURY.

Phys'iol'ogy. Anatomy shows us that animals and plants are wonderfully constructed. But after we understand their architecture and even their minute structure, the questions remain: What are all the organs and tissues for, and what takes place within the parts that are actually alive? Physiology attempts to answer questions of this nature. It therefore stands in contrast with anatomy and is supplementary to it. The activities of the body are varied and depend on life for their manifestation — they may be called vital activities. Physiology embraces a study of them all. This subject began to attract the attention of the ancient medical men, who wished to fathom the activities of the body in order to heal it in disease. But it is so difficult a thing to begin to comprehend the activities of life, that even the simpler relationships were imperfectly understood, and they resorted to mystical explanations. They spoke of spirits and humors in the body as causing the various changes. The arteries were supposed to carry air, the veins only blood, and nothing was known of the circulation. In these early days, also, anatomy, physiology and medicine were united into a poorly digested mass of facts and fancies. This state of affairs lasted till the 16th century, and then the awakening came through the efforts of gifted men endued with the spirit of independent investigation. The advances made depended upon the work or leadership of these men, and certain periods of especial importance should be pointed out.

First is the period of Harvey (1578-1657). In his time the old idea of spirits and humors was giving way, but there was much vagueness about the relationships and activities of the body. He helped to illuminate the subject by showing a connection between arteries and veins and demonstrating the circulation of the blood. Harvey (*q. v.*) did not see the blood passing through the capillaries from arteries to veins, but his reasoning was unassailable that such a connection must exist and that the blood makes a complete circulation. He gave this conclusion in his medical lectures as early as 1619, but did not publish his views until 1628. It was reserved for Malpighi, in 1661, actually to see the circulation through capillaries under the microscope, and for Leeuwenhoek, in 1669 and later years, greatly to extend the observations. The next great period was marked by the work of Haller (1708-77), who made physiology an independent subject. It had previously been united with anatomy and medicine; he made it a subject to be studied for its own sake. The period that marks the beginning of modern physiology came next, and was due to the genius and force of Johannes Müller (*q. v.*). He studied physiology so broadly that he made it comparative. He used every means at his command — experiment, observations on simpler animals, the microsope, the discoveries in physics, chemistry and psychology. He (1801-58) made physiology systematic and broadly comparative. Not only did he do important work himself, but as professor of physiology at Berlin he trained many talented young men, among whom were Ludwig (1816-95), Du Bois-Raymond (1818-96) and Helmholtz (*q. v.*). Thus his influence reached to the present time and affected recent physiology. With these distinguished German physiologists should be mentioned Claud Bernard (1813-78) of France and Sir Michael Foster of England (1836–).

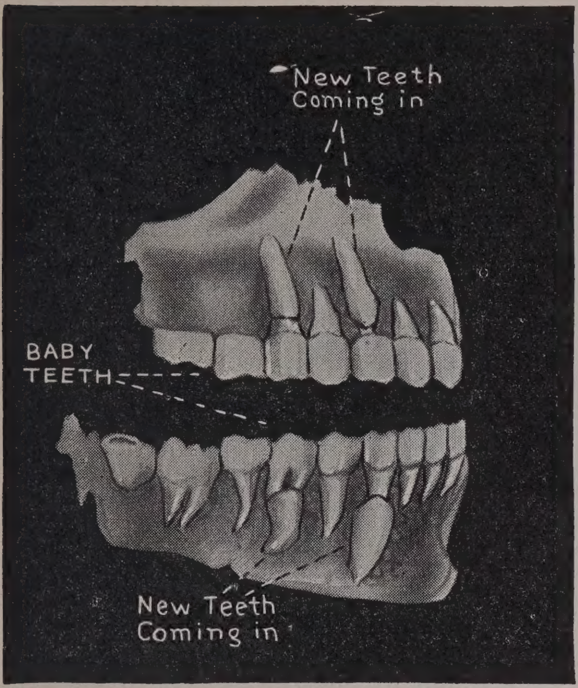
Physiology has broadened and deepened until it includes the vital activities of the entire animal and vegetable worlds. Every action or function dependent upon life is embraced by it. These are so varied that they must be reduced to order and system, and, when that has been done, we observe that all the functions may be grouped under three great headings: Those concerned with *nutrition;* those connected with *relation;* and those pertaining to *reproduction.* Nutrition embraces every activity concerned in nourishing the body. It must include a discussion of the blood, its structure, circulation and changes; the heart and the influences which affect it; the digestive system, the kinds of food, the nature of digestion, the absorption of the food into

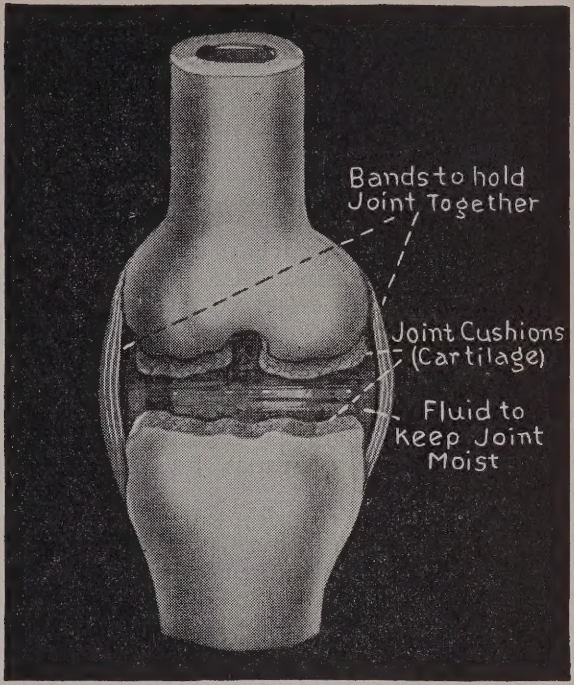
THE MACHINE WE LIVE IN


CAMERA ROOMS
SOUND RECEIVER
OPENING OF PASSAGE TO AERATING ROOM
PIVOT JOINT
BALL AND SOCKET JOINT
BELLOWS WHICH PUMP AIR INTO AND OUT OF AERATING ROOM
HINGE JOINT
BALL AND SOCKET JOINT
HINGE JOINT
HINGE JOINT

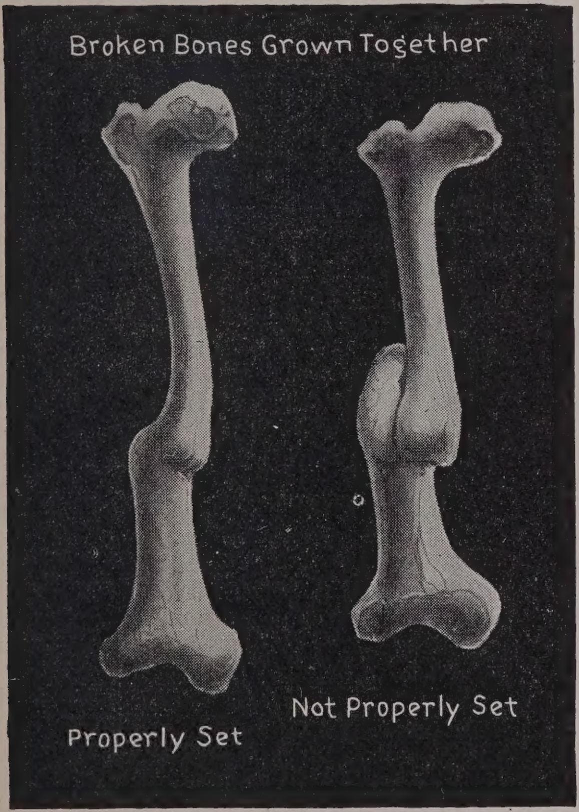
Our bodies are really machines, or rather, machine plants with a series of shops and people working in them. These workers are the cells. They are divided into groups, and each group does only one kind of work. This picture gives you an outside view of the mechanical man with the machinery which enables him to move about and do his work in the outside world, the joints or hinges of the body and the muscles by which they are worked. You also see the location of the camera, the telephone, and the bellows which keep the fires of life burning brightly.

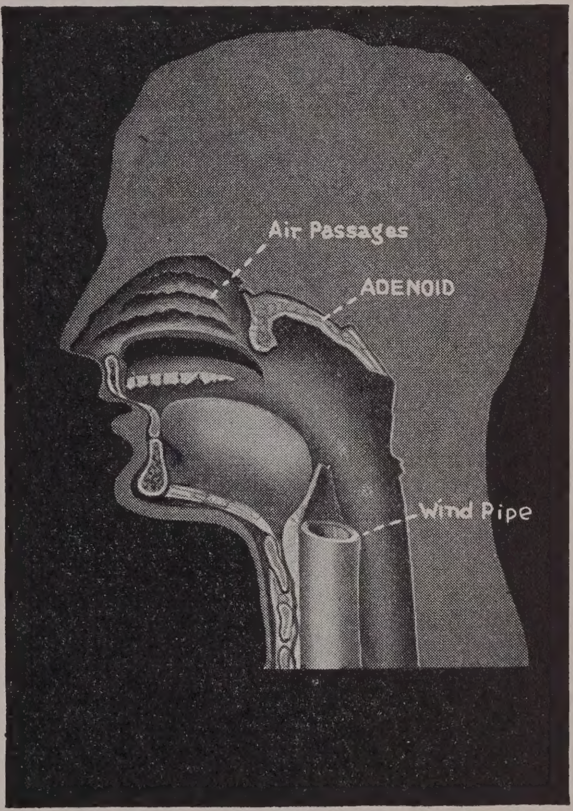
THINGS WORTH KNOWING ABOUT OUR BODIES


New Teeth Coming in
BABY TEETH
New Teeth Coming in


Bands to hold Joint Together
Joint Cushions (Cartilage)
Fluid to Keep Joint Moist

The first picture shows how our second teeth come in. You see, they really push out our baby teeth and, following right after them, take their places. The next picture shows how our joints are held together, and cushioned so that jolts will not injure them.


Broken Bones Grown Together
Not Properly Set
Properly Set


Air Passages
ADENOID
Wind Pipe

This picture shows why we should have broken bones properly set. The setting on the right is a very bad job. A limb so set is not only liable to be easily broken again but will be crooked and shorter than the other limb.

The next picture shows you what happens when your adenoids become enlarged. They stop up your nose so that you can't breathe well. A doctor by a very simple operation can cut down this obstruction, and it is very important for your health that this should be done.

the circulation, the secretion of substances like the digestive juices and other forms of secretions in the body; and the action of the liver, pancreas and similar organs. Respiration is connected with nutrition, because the oxygen brought in is used in all processes of the body, and the removal of the carbon dioxide (CO_2) is an aid to nutrition. One must, therefore, learn all about the breathing organs and the nature of the exchanges between the blood, the air and the tissues. The living protoplasm of the body is continually undergoing disintegration; it breaks into carbon dioxide, water and nitrogenous compounds. In order that nutrition may be effectively carried on, these waste-products must be removed. This topic includes the action of the kidneys, the lungs and the skin The varied chemical changes in assimilating the food and the reverse set of changes resulting in the liberation of energy must be considered under nutrition.

Another great division of physiology deals with the means by which an animal or plant is brought into proper relation with its surroundings This in higher animals includes the action of the nervous system and sense-organs as well as control of the nervous system over the organs. The muscles and organs of protection are also involved in bringing about a harmonious relation between surroundings and the animal. Finally, reproduction refers to the preservation of the race, and is more for the benefit of the race, generally speaking, than for the individual.

A study of all these varied activities is physiology. Reference must be made to text-books and manuals for further consideration. It is a common fault with our elementary physiologies to go too much into the discussion of the effects of alcohol and narcotics. The importance of such a discussion is unquestioned, but the facts of physiology and hygiene should stand out in unrivaled prominence. Among the smaller texts Huxley's *Lessons in Elementary Physiology* is the most lucid statement of the facts of physiology yet presented. Among the best books of greater extent may be mentioned Foster's *Textbook of Physiology;* Stewart's *Manual of Physiology;* Kirke's *Handbook of Physiology;* Howell's *American Textbook of Physiology;* Verworn's *General Physiology;* Martin's *The Human Body;* and Hall's *Textbook of Physiology.* See BLOOD, BRAIN, CIRCULATION, EAR, EYE, HEART, LIVER, LUNGS, MUSCLE, NERVES, STOMACH, TEETH. WM. A. LOCY.

Physiology of Plants. Physiology may be defined as that branch or department of science which treats of the activities of living beings. These essentially are the same in plants as in animals, but often are simpler. Plant physiology is concerned with the action of the plant body as a whole, the part which each of its organs takes and the ways in which they are adjusted to one another and the external world. (See ECOLOGY.) The work of a particular part or organ is called its function. The important general functions of plants are absorbtion; water transfer; transpiration; nutrition (in the narrower sense) including digestion, photosynthesis and assimilation; secretion; respiration; growth; and movement. (See these topics and IRRITABILITY.) In the higher plants the root is an absorbing organ for water, mineral salts and such organic matter as is soluble in water ; the root, stem and leaves are furnished with strands of tissues along which water and foods can travel readily; the leaves and the surface of the stem, at least when young, are organs of absorption and evolution of the gases carbon dioxide and oxygen; they also lose water by evaporation; and they are most important as organs for making carbohydrate foods. All these functions, however, may go on in a single cell of one of the simplest plants.

Pian′ofor′te, a stringed musical instrument played by keys, developed out of the clavichord and harpsichord. It differs from these chiefly in the introduction of hammers with which to put the strings in vibration, connected with the keys by a mechanism that enables the player to modify the intensity of the sound at will. It is this peculiarity to which the name is due, *piano* being the Italian for soft and *forte* for loud. The strings are stretched across a compound frame of wood and metal, composed of bars, rods and strengtheners of various kinds. This framework includes a wooden sound-board. The mechanism by which hammers are connected with the keys is called the *action* of the instrument. The duration of a note is regulated by the damper. This consists of a piece of leather, resting on the top of the string and connected with the back part of the key by a vertical wire. When a key is pressed down, its damper is raised off the string so as to allow the sound to be clear and open; but when the finger is taken from the key, the damper wire falls immediately, and the damper presses down on the string, muffling and stopping the vibration. One of the pedals is called the loud, the other the soft pedal. Great difference of detail exists in the "actions" of different makes, but all have the same essential parts. See Hopkins' *Musical Instruments.*

Piaster (*pĭ-ăs′tẽr*), "a plaster" in the Latin; in the Romance languages "anything spread out," "a plate," "a coin." The word is applied to an old Spanish coin, worth not quite $1.00 of United States money. It was divided into eight *reals*, and hence was called "a piece of eight." The Italian *piaster* is an imitation of and nearly equal to the Spanish *piaster* in value.

The Turkish *piaster* is worth about four cents of United States money.

Pibroch (*pē′brŏk*), a form of bagpipe music, generally of a warlike character. The rhythm is irregular and difficult for a stranger to follow; but, played by a good piper, it has a powerful effect.

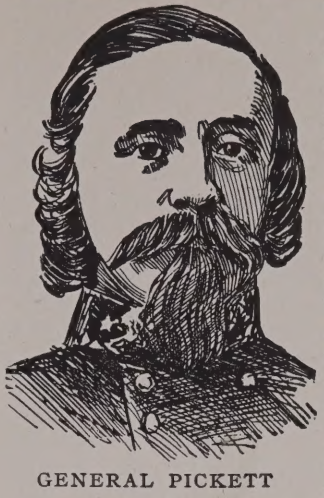
Picayune (*pĭk′ȧ-ūn′*), a name derived from the Carib language and used in Louisiana for a small coin worth six and one quarter cents, current in the United States before 1857 and known by various names in different states — fourpence, fippence, fip and sixpence.

Pick′ens, Francis Wilkinson, an American statesman and diplomatist and a governor of South Carolina, was born at Togadoo, S. C., in 1805, and died at Edgefield, S. C., in 1869. He was a lawyer of prominence, and in 1832 became a member of the legislature. He was a member of Congress for ten years, and in 1857 was appointed minister to Russia. He was an ardent advocate of nullification, extreme democracy and state-sovereignty. As governor of South Carolina in 1861 he demanded the surrender of all Federal property within the state; and he caused the erection of the batteries from which was fired the first shot against Fort Sumter.

Pick′erel. See Pike.

Pick′ering, Edward Charles, a distinguished American astronomer, born at Boston, July 19, 1846; educated at Harvard, where he graduated from Lawrence Scientific School in 1865. He immediately accepted an instructorship in physics at Massachusetts Institute of Technology, where he founded the first physical laboratory in America. There he remained until 1877, when he went to Harvard as professor of astronomy and director of the observatory, a position which he has filled with increasing distinction during a quarter of a century. Professor Pickering's most original work perhaps is in stellar photometry and stellar spectroscopy. But the conception and skillful direction of the many lines of work carried on at Harvard Observatory, as well as the building up of the observatory itself, must always remain a great service to science and a monument to Professor Pickering. He is a member of the National Academy of Science, the author of several important volumes and the editor of *Harvard Annals*, an invaluable series of astronomical reports.

Pick′ett, George Edward, an American soldier who won worldwide distinction in the Confederate service at Gettysburg, where he made one of the most gallant and desperate charges ever known in the history of war. He was born at Richmond, Va., Jan. 25, 1825, and graduated at West Point in time to enter the army as a second-lieutenant during the War with Mexico. He was brevetted first-lieutenant and afterwards captain for conspicuous bravery in Mexico. He served for the most part on the frontier between 1848 and 1861. At the outbreak of the Civil War he resigned from the army of the United States and entered the Confederate service as a colonel. He became a major-general in 1862. He was engaged in several desperate battles under Lee, but won special distinction as the leader of the assaulting column, July 3, 1863, upon which hung the fate of the Confederacy. The point reached by his troops in this charge, and from which they were at last driven back, is marked upon the field by a granite monument. In the campaign of 1864–5 he made the final stand at Five Forks, and he prevented the capture of Petersburg by General Butler. At the close of the war he returned to Richmond and engaged in life-insurance, dying at Norfolk, Va., July 30, 1875.



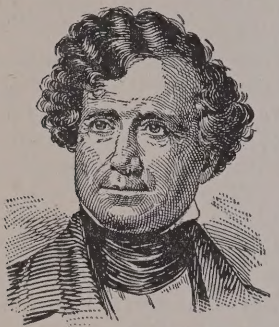
GENERAL PICKETT

Pick′wick Papers. This novel by Dickens was published in 1837, and at once made its author universally popular. Its principal character is Mr. Pickwick, whose adventures are largely humorous, although pathos also is involved. The most absurd as well as the principal episode is the breach-of-promise suit brought against the hero at the instigation of rascally pettifoggers. It results in his incarceration in Fleet Prison for a considerable period, until he is persuaded to pay the unjust judgment. The adventures are woven into a plot involving several tales of love. The book aims at satirizing many aspects of English life, especially the petty lawyers and the prison-system. It abounds in clever characterizations, the most notable of which, aside from that of Pickwick, probably is that of Sam Weller.

Picts, a people, who from A. D. 296 to 844 inhabited eastern Scotland from the Forth to the Pentland Firth. Sometimes we find them called by the name Cruthnig. The first mention of them in Roman annals is in connection with campaigns in Britain in 296 and 306 A. D. The first mention of the Scots is made in connection with their being united with the Picts in harassing the Romans in 360 A. D. The Pictish kingdom was overthrown about 850, when the Scots became the predominant race. It is undecided what was the language the Picts spoke, though the prevailing opinion is that they were a Celtic race. See Skene's *Chronicles of the Picts and Scots.*

Pied′mont, the northwest of Italy, comprising the modern provinces of Turin, Alessandria, Cuneo and Novara. Area, 11,336 square miles; population 3,423,854. Much of its land is reclaimed by irrigation and made highly productive. The system of irrigation is well-nigh perfect. It is watered by the upper Po. The country is rich in Waldensian memories.

Piedmont Region, The, is a part of the Atlantic coastal plain of the United States, lying further inland than the low and level area nearest the ocean, but continuous with it. There is a real geographical difference between the Piedmont region and the coastal plain proper, for the former is higher, more rugged and geologically older and based upon harder strata of rock. There is a falls' line between the Piedmont region and the coastal plain proper, where most of the coastal rivers, in leaving the harder for the softer strata of rock, have worn a series of rapids and precipitous falls. The Piedmont region in the south is from two to three hundred miles broad; but in the north, especially in New York, very narrow.


FRANKLIN PIERCE

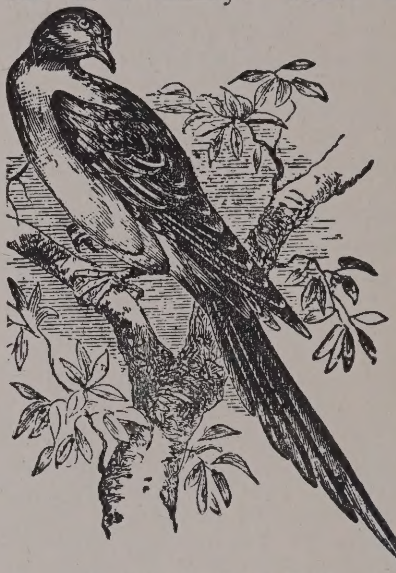
Pierce, Franklin, fourteenth president of the United States, was born in New Hampshire, Nov. 23, 1804. He early came into political prominence in his native state. In 1837 he was elected to the United States senate, of which he was the youngest member. In 1842 he resigned his seat. He was a Democrat of the Jacksonian school and a zealous advocate for the admission of Texas, with or without slavery. He volunteered as a private in the Mexican War, but President Polk made him a brigadier-general. In 1852 he received the Democratic nomination for the presidency and obtained the electoral votes of all the states, save Vermont, Massachusetts, Tennessee and Kentucky. During his administration the Missouri Compromise was repealed by the passage of the Kansas-Nebraska bill. At the close of his administration he spent three years in Europe; returned home to Concord; but took no part in politics. He died at Concord, N. H., Oct. 8, 1869.

Piero dei Franchesi. See Francesca, Piero della.

Pierre, So. Dak., the capital of the state and county-seat of Hughes County, is situated near the site of old Fort Pierre, about the center of South Dakota. The fort was founded in 1829, and was named after one of its early fur traders. It has good public schools, Pierre University (Presbyterian) and a governmental, Indian industrial school. Pierre is on the Missouri River and has the service of the Chicago and Northwestern Railroad. Population 3,656.

Pierre′pont, Edwards, American lawyer and diplomat, was born at New Haven, Conn., in 1817; and died at New York, March 6, 1892. As attorney-general of the United States he conducted the trial of Surratt, an accomplice in the murder of President Lincoln. In 1876–8 he was minister to England. As a jurist he had a wide reputation, and European governments were influenced by his writings upon international law.

Pig. See Swine.


PASSENGER-PIGEON

Pigeon (*pĭj′ŭn*), a name for members of the dove family. There are about 300 species all over the world, being most abundant in the East Indies. Only two are found in the Eastern United States — the wild pigeon and the turtle-dove. The wild or passenger-pigeon is exceedingly rare. It formerly was very abundant, perching in the forests in such numbers as to break limbs of trees and covering a large territory in their daily flight in search of food. During migration they flew in such large flocks that it would sometimes require days for them to pass a particular point. They were nearly exterminated by wholesale slaughter. The bird is about 17 inches long, with large wings and a long, pointed tail. The male is bluish above, purple brownish-red below, more violet behind, with a black bill and yellow feet. It depended largely upon acorns and beechnuts for food, with occasional feasts on grain and berries. The turtle or mourning dove still is quite common. The long, soft, mournful note of the male during the nesting season is known to nearly everyone in the United States. It is a smaller bird than the passenger pigeon, being about 11¾ inches long. The upper parts are olive grayish brown, the neck iridescent, the breast pinkish and the belly buff; the outer tail-feathers are tipped with white. They nest in isolated pairs, and two broods are produced a year. There is a large number of domestic pigeons, all descended from a wild form generally believed to be the blue rock-pigeon; but there is reason to doubt this. Pigeon-breeding has been engaged in throughout Europe and eastern countries for centuries. It is a favorite pastime in the United States. A great range of variation has been produced by breeding. Some of the more conspicuous varieties are the fan-tail with large spreading tail; the pouter, with inflated breast; the tumbler; carrier; trumpeter; barb; and jacobin. Darwin made use of pigeons in observing the changes produced in animals under domestication, through the influence of artificial selection. The breed which is called the carrier pigeon, or the homing pigeon, is employed for carrying messages. There is no real distinction between doves and pigeons.

Pig'ments, the color materials of painting. It is necessary to distinguish these from dyeing colors. Pigments are insoluble, and, mixed in oil or water or other liquid, are used for painting. Dye-stuffs are held in solution as tinctorial substances. A pigment must have covering power, that is, it must cover and conceal with an opaque covering the surface on which it is spread. When dry, it must have durability; must resist the air. It should also dry quickly. Pigments for artistic work need to be prepared with more care and of better material, if possible, than pigments for mechanical purposes. A house can be repainted, but a madonna cannot be. Artists' pigments are ground to a finer powder than ordinary paints.

Pike, a ravenous fresh-water fish, with long slender body, broad snout and large mouth. There are five species of the pike family. One inhabits the fresh waters of both continents; the other four are American species. The muskallunge, attaining a length of eight feet, is the finest and largest of the pikes. It is found in the Great Lake region and, occasionally, in the Ohio valley. The smaller varieties are commonly called pickerel in the United States. All rank high as food.

Pike's Peak, a peak of the Rocky Mountains, 65 miles south of Denver in Colorado, discovered by Captain (afterwards General) Z. M. Pike in 1806. It is 14,134 feet high. A railway from Manitou to the top, nine miles in length, was constructed in 1891.

Pi'late, Pon'tius, the Roman procurator of Judæa, who, after his most solemn assertions of the innocence of Christ, yielded to the demands of His accusers and gave Him up to be crucified. There are quite a number of traditions as to Pilate's end: He committed suicide; he was beheaded by Nero; he embraced Christianity. In the Ethiopic church he is celebrated as a saint. One legend tells how his body was thrown into the Tiber, making an overflow, another that the body was carried to Mount Pilatus and there sunk securely in the deep pool on its top. But here again it made storms arise, and every year the devil on Good Friday lifts him out of the pool and places him on the judgment-seat, where he washes his hands anew. In the Greek church Pilate's wife has been canonized as a saint. His era is the first half of the 1st century.

Pile-Driver, a machine for driving piles. The ordinary form consists of a heavy iron weight which can be raised vertically from 10 to 40 feet between upright guides and then be released to fall on the pile beneath. The common weight of the ram is from 1,000 to 2,000 pounds, but weights of 4,000 pounds and over are occasionally used. It usually is lifted by a wire-rope, which is wound on a drum revolved by a small steam-engine, the ram being released when the desired height is reached. In the Vulcan-Nasmyth steam pile-driver a hammer is attached directly to the rod of a piston which works in a vertical steam cylinder. The admission of the steam to the cylinder causes reciprocating hammering, the number and character of the blows being regulated by an adjustable valve-gear. Another form of pile-driver is the gunpowder pile. In this the explosive force of gunpowder confined in a suitable mortar is used to drive the pile.

Pileus (*pī'le-ŭs*), the spreading cap-like portion of a mushroom or toadstool. See BASIDIOMYCETES.

Pil'grim Fathers, the founders of the first English colony settling in Massachusetts. This colony belonged to a sect of separatists originating in Yorkshire, England, who, previous to sailing for the New World, had spent some time as exiles for religion's sake in Holland. The company, numbering 100 men, women and children, set sail from Plymouth, England, Sept. 6, 1620, bound for Hudson River. But after a long and stormy voyage they were driven on the bleak and desolate shores of Cape Cod. They landed on Dec. 21, 1620, at a place to which they gave the name of Plymouth.(*q. v.*) A monument to their memory has been erected there. Before landing they drew up and signed a compact of government, which is regarded as the first written constitution we have an historical account of.

Pilgrim's Progress. This famous masterpiece was composed by John Bunyan (1628-88), a tinker of Bedfordshire, England. Having become converted to intense faith in the free-church point of view, he began to preach and was arrested for delivering sermons without a license. He was confined in Bedford Jail for over eleven years (1660-72), and during this period composed *Pilgrim's Progress.* This is an easily interpreted allegory describing the spiritual experiences of Christian, the pious man, on the way to the heavenly Jerusalem. He passes Neighbors Obstinate and Pliable, Worldly Wiseman, Apollyon, the Valley of the Shadow of Death, the Slough of Despond, Doubting Castle and Giant Despair. The allegory in a simple and yet brilliant way presents the religious notions current among the common people of the time.

Pil'lory, an instrument for the public exposure and punishment of criminals. It consisted of a post and frame fixed on a platform. In the frame, which is attached to the post after the manner of a sign-board, are three holes through which the hands and head of the criminal are thrust, and out of which he cannot draw them. Standing behind the frame, he faces the gazing crowd. The exposure was a chief part of the punishment. At one time it was customary to shave the head wholly or partially. In the laws of Edmund I it was required so to construct the pillory as not to put the body "into peril." In the earliest pillory punishments they seem to have been confined to offenses not amounting to felony, called misdemeanors, as using deceitful measures and weights, libel, seditious writings. Later on, common scolds, brawlers and others were punished in this way. In the 17th and 18th centuries it came to be used for the punishment of political offenders. It was abolished altogether in Britain in 1837.

Pil'low, Gid'eon John'son, an American soldier, was born in Williamson County, Tenn., June 8, 1806. He graduated at the University of Nashville in 1827, and not long after was admitted to the bar. During the Mexican War he was appointed a brigadier-general of volunteers. He commanded the right wing at Cerro Gordo, where he was wounded. Being promoted for gallantry, he took part at Molino del Rey and Chapultepec, where he was again and more severely wounded. He practiced law in his own state until the beginning of the Civil War, to avert which he had proposed various compromises. But having entered the Confederate service in 1861, he rapidly advanced to the command of a brigade, and took part in the battles of Belmont and Fort Donelson. He was second in command when the latter was taken by the Federal troops, but made his escape. He afterwards served under General Beauregard in the southwest. He died in Lee County, Ark., Oct. 8, 1878.

Pi'lot, a person deputed to take charge of the course of a ship through a particular sea-reach or dangerous channel or out of or into port. He "stands at the wheel" we say. He must know how to manipulate the rudder and must be familiar with the channel. A steamboat neglecting to have a duly licensed pilot for a given port or stretch of water would forfeit its insurance in case of an accident.

Pinck'ney, Charles Cotes'worth, an American statesman, was born at Charleston, S. C., Feb. 25, 1746. He took part in the earliest movements of the Revolution of 1776. In the war he did noble and conspicuous service. He was Washington's aide-de-camp at Brandywine and Germantown. He saw much active service until 1780, when he was taken prisoner at the surrender of Charleston. A member of the convention that framed the constitution of the United States, he introduced the clause forbidding religious tests of qualification for office. In 1796 he was sent as minister to France, but the Directory refused to receive him, and he had to quit the country. War between France and the United States was threatening. The French intimated to Pinckney and his associates that a gift of money from the United States would avert war. Then Pinckney burst out in the famous utterance: "War be it then; millions for defense, but not a cent for tribute." He was thrice an unsuccessful candidate for the presidency. He died at Charleston, S. C., Aug. 16, 1825.

Pin'dar, the chief lyric poet of Greece, was born about 522 B. C. near Thebes, and died at Argos in 443 B. C. He began his career as a writer of choral odes at 20, and, soon reaching the highest rank, composed odes for men in all parts of the Hellenic world. Wherever he went he was honored and loved for his own sake as well as for his art. States vied with each other in doing him honor. Two conquerors of Thebes, Pausanias the Spartan, during the Peloponnesian War, and Alexander the Great left no other dwelling in Thebes standing than the house in which Pindar had lived. Of most of his poems we have fragments only. The *Triumphal Odes*, celebrating triumphs in the Olympian, Pythian, Nemean and Isthmian games are entire. Pindar treats the victory not as a mere incident, but as connected with the victor's whole life and history. He loves to dwell on the *moral* side of it; not merely on the bodily prowess, but on the temperance, love to parents or piety which secured the favor of the gods who granted success. The groundwork of his poetry consists in the legends which form the Greek religious literature.

Pin'dus Mountains, a range extending from north to south through the western part of Greece. At the southern end it attains a height of nearly 8,000 feet. The range connects with a range to the north and the name is sometimes used to cover this also, but originally this name was confined to that portion which separates Thessally from Epirus.

Pine, species of the genus *Pinus*, the largest genus of the conifers and distributed throughout north temperate regions. They are exceedingly important forest-trees, and are developed in a most magnificent way in our western mountain regions. There are 37 species in the United States, 25 occurring in the west, nine in the Mississippi basin, and seven in New England and the middle, Atlantic states. They are found under widely-varying conditions: down by the sea and up the mountain to the timber-line. The leaves are evergreen. The branches grow in imperfect whorls about a central trunk. The naked flowers appear in early spring, and the fruit is a cone. Wood, turpentine, rosin and tar are the products. The pine is so important a timber-tree that it seems doomed as a tree of the forest. It does not send up shoots, and its seeds soon lose their vitality. Far and wide nut-bearing trees have driven the pines backward from rich lands to the sands. The commonest species in the eastern United States are *P. Strobus*, the white pine; *P. resinosa*, the red pine; and *P. palustris*, the long-leaved or Georgia pine. The pitch-pine, abundant in the eastern pine-barrens, is well-known. In the western mountain region *P. ponderosa*, the great yellow pine, is one of the most important lumber-trees. *P. edulis*, the piñon or nut-pine, occurs in southern Colorado and southward. The white pine is a magnificent tree and the most valuable timber-tree of the eastern states. It grows to a height of 80 to 175 feet. The branches, whorled horizontally about the splendid, erect column, are most picturesque. The bluish-green, needle-shaped leaves are arranged along the branches in clusters of fives. The cones are long and slender. Its range is from Newfoundland to Manitoba, along the Alleghenies south to Georgia. The wood is light, soft, straight-grained and takes a fine polish; is used in cabinet-work, in interior finish and for shingles, lumber, masts and spars. The red or Norway pine is a beautiful tree belonging to the north. It is valued for its lumber and grows from 70 to 150 feet high. The long-leaved Georgia, southern or yellow pine is a very important timber-tree. Its wood is of a rich orange-yellow, very ornamental. Much turpentine, resin and tar are obtained from this tree. It rises from 100 to 120 feet, and is noted for its beautiful foliage. The leaves, from 10 to 15 inches long, grow in thick tufts at the ends of the branches. The yellow pine of the west occasionally attains a height of 230 feet, frequently of 150 feet. It is found from British Columbia to Mexico east to Nebraska and Texas. One of the most important pines in cultivation is the Scotch pine, *P. silvestris*, the common pine of northern Europe. The Austrian pine, *P. Austriaca* (*P. Laricio*), is a fast-growing and massive tree and common in cultivation. See Keeler: *Our Native Trees.*

Pinero, Sir Arthur Wing, the son of a solicitor, was born in London, May 24, 1855. Like Shakespeare, he was an actor but he left the stage in 1881 and since then has devoted himself entirely to play-writing. He began his stage career in 1874 at the Theatre Royal in Edinburgh. Two years later he went to London on an engagement at the Globe Theatre. Then, for five years, he was a member of the Lyceum Company. He was knighted in 1909.

His first production, to attract general attention, was "The Money Spinner", which was produced at the St. James's theatre, London, in 1880. His most celebrated play is "The Second Mrs. Tanqueray", which was first played at the same theatre in 1893. It at once created wide discussion, both because of the art displayed in the work and the nature of the subject, which deals with the sex problem.

In the general opinion of critics it places the author among the very first of living dramatists.

Pine'apple, the fruit of *Ananas sativa*, a member of the *Bromelia* family. It is native to tropical America, and has become naturalized in the tropical regions of Asia and Africa. The chief regions of "pine-growing," as it is called, which supply the markets of the United States, are southern Florida and the various West Indian islands, the Isle of Pines being named from this industry. The so-called fruit consists of a fleshy, cone-like flower-cluster, which includes the axis and bracts and flowers of a whole inflorescence. Numerous cultivated forms have been developed.

Pine Bluff, Ark., county-seat of Jefferson County, is built on a high bluff on the south bank of Arkansas River, about 120 miles from its mouth. It lies 38 miles southeast of Little Rock, and is surrounded by rich agricultural country. It contains iron-works, manufactures cottonseed-oil, flour, bricks and lumber, and ships large quantities of cotton. The city has admirable public schools, a convent, a colored industrial school (R. C.), fine churches and an elegant opera-house. It possesses all the adjuncts of a progressive city: waterworks, electric lights and an electric street-car system. Pine Bluff has river-service for passengers and freight, besides being served by five railroads. Population 25,000.

Pink, the name of a species of the genus *Dianthus* and extended to the members of the pink family. The common pinks of old gardens are supposed to have descended from *D. plumarius*, a native of eastern Europe. The sweet-william or bunch-pink is *D. barbatus*, abundant in all country gardens and a native of Europe. The carnation or clove-pink is *D. caryophyllus*, which occurs in a great variety of colors, either pure or variegated, and is grown mostly indoors. Some of the wild flowers which belong to this family are also called pinks, as for example, the fire-pink (*Silene*

Virginiana), which occurs in woods in early spring and is conspicuous on account of its crimson red petals.

Pins. These simple articles, almost a symbol for a thing of the smallest value, not only are useful, but are a prime necessity. Yet they did not come into use without the help of art and inventive genius. The earliest pins probably were thorns or small bones of fish or other animals. Later there were pins of brass, copper or iron. These were of various forms, and often had gold and ornamental heads. Modern solid-headed pins are made on a machine that was patented by Wright, an American, in 1824. The process is as follows: Wire of suitable sizes is manufactured, mostly of brass, but also of iron or steel. When reeled, the wire is ready for use. A pair of pincers, worked by a machine, draws from a reel of wire a length sufficient to make a pin; its head, which is made at the same time, is straightened by passing through studs. The pin-length is seized by jaws from which a portion of the wire, of which the head is to be made, projects and is exposed to blows from a die-hammer. The pin is then pushed forward twice, each time receiving a blow from the die-hammer. The wire is then cut to the length of the pin. The headed blanks drop into a slot formed by two inclined and bevel-edged bars. The opening between the bars is just large enough to prevent the heads of the pins from falling through, so that the blanks become sustained in a row along the slot. They are then caught between two parts of the machine, which causes them to rotate, and are thus passed in front of the cylinder which acts like a file and points the pins. As many as 160 a minute can be turned out by a single machine. The pins are cleaned of grease and other matter by boiling them in weak beer. They are next coated in tin, and are then brightened by shaking them in a bag or barrel with bran or sawdust. They are papered by machinery, which is as ingenious as the means by which they are made. America uses nearly 150 pins per inhabitant per year, which is the highest average in the world. Pins are exported from the United States over nearly all the world, although needles are largely imported from England.

Pinturicchio (*pēn'tŏŏ-rēk'kē-ō*), an Italian artist whose name means The Little Painter, was born at Perugia in 1454 and died at Siena in 1503. Fresco-painting was his strong point, and he left only a few easel pictures. He decorated the library of Siena cathedral, and the work was so brilliant in conception and execution, for he knew every resource of art and was a master of ornament, that it is his finest fresco. He was a link between Perugino and Raphael. His real name was Bernardino de Betto Bagio, and he was a man of high character.

Pipe'fish, a long, slender fish with a straight, tubular snout, like a pipestem. It is common on the Atlantic coast from Newfoundland south. The male has a brood-pouch under the tail, in which the eggs are developed and the youngest protected for some time after they are hatched. Several other species are found in different seas.

Piq'ua, O., a city of Miami County, on Miami River and the Miami and Erie Canal, in a rich agricultural section, 27 miles north of Dayton and 72 west of Columbus. It is served by a traction-line from Toledo to Cincinnati and by the Pennsylvania and the Cincinnati, Hamilton and Dayton railway. It has good water-power from the Miami and Erie Canal. Its industries include large strawboard, hosiery and woolen mills, furniture, carriage, stove and bent wood works; the American School Desk Co.'s factory is here, and also a corrugated-iron works. Piqua has fine schools, churches, banks and a public library of 15,000 volumes. Population 18,000.

Pi'racy is robbery on the high seas, and, although considered a crime at the present time by all nations, formerly the sea-rover was as much a pirate as a trader. The Phœnicians combined piracy with lawful seafaring enterprise. In the days of Homer piracy was considered a respectable, even a dignified, calling, and the Greeks had a natural genius for it. Cilicia was long the headquarters for Mediterranean piracy, until in 67 B. C. Pompey made his memorable expedition against the pirates with great naval and military forces. The Norse vikings were the terror of western coasts and waters from the 8th to the 11th Christian centuries. The Hanseatic League was formed for mutual defense against the Baltic and other pirates. Later the Moslem rovers scourged the Mediterranean, commingling naval war on a large scale with peddling, thieving and stealing people as slaves. Algiers was a stronghold of pirates till well into the 19th century, and in the 17th century the English Channel swarmed with Algerine pirates. In 1635 these corsairs entered Cork Harbor, and carried off a boat with eight fishermen, to be sold as slaves in Algiers. The buccaneers preyed mainly on the Spanish commerce with the Spanish-American colonies. Captain Kidd, (*q. v.*), who was sent out against pirates in 1696 by a private company in London, was found to be playing the game of pirate himself, was arrested and tried for piracy and murder, found guilty and hanged on May 23, 1701. The original of Scott's *Pirate* was John Gow, who, though bold and successful under the guise of friendship, was proved to be a great villain, and with nine of his men was executed. So late as 1864 five men were hanged in London for murder and piracy. The African slave-trade was not considered piracy by the law of nations, though the United States and Great

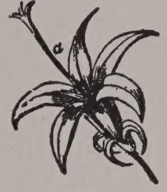
Britain declared it to be such by statute, and after 1840 Austria, Prussia and Russia made the same declaration. The home of professional piracy is now confined to the Malay Peninsula.

Piræus (*pī-rē'ŭs*), the harbor of Athens, Greece; Athens being about five miles from the sea. As far back as the time of Pericles long walls joined the port with Athens. These were built for protection, so that between them travel to and from the port and the city would be undisturbed. A few traces of the wall remain. The fortification being destroyed by Sulla 86 B. C., the town fell into decay. Since 1834 the modern town has grown up, for more than half the export-trade of Greece passes through Piræus. It has a large trade. Population 70,000.

Pisa (*pē'zȧ*), one of the oldest cities of Italy and once the rival of Venice and Genoa. It is on the Arno, 50 miles west of Florence and 13 northeast of Leghorn. It is a city of fine buildings, foremost among which is the cathedral, built in the 11th century, with a noble dome, fine paintings by Cimabue, Andrea del Sarto and others and beautiful, marble altars. Near by stands the Leaning Tower, a splendid specimen of southern Romanesque architecture but peculiar in that it deviates about 14 feet from the perpendicular. This is not due to original design. The tower seems to have begun to heel to one side when the third story was completed: the architects deliberately accepted the conditions and adhered to the inclining position, but diminished the slope of the upper stories so as to keep the center of gravity well within the walls. The tower is 180 feet in height, and consists of eight stories divided by rows of columns, the last, which contains the bells, being smaller in diameter than the others. The tower was built in 1174 and succeeding years, but the eighth story was not completed until the middle of the 14th century. Ancient Pisa was an Etruscan city, which became subject to Rome in the 2d century B. C. Early in the 11th century Pisa had developed into a powerful republic, possessing a formidable fleet and much territory along the Tyrrhenian Sea. Through the 11th century Pisa was at its height of prosperity, and the splendid monuments of art adorning it belong to this period. Population 65,212. The industries are confined to silks, cottons, ribbons and the working of coral and alabaster. Pisa also is a province with an area of 1,179 square miles and a population of 342,144.

Pisidia (*pĭ-sĭd'ĭ-ȧ*), in ancient geography, was a country in Asia Minor, north of Pamphylia, which separated it from the Mediterranean, and south of Phrygia. It was a rugged and mountainous district comprising some of the loftiest portions of the great range of Taurus. In early times it was occupied by wild, lawless races of mountaineers who never were entirely subjugated by the various powers ruling Asia Minor at different times. The first mention of Pisidians in history occurs in the *Anabasis* of Xenophon. Later they resisted the march of Alexander the Great. In Strabo's time they had passed quietly under the Roman power. Pisidia once contained considerable towns, the ruins of which have been brought to light recently by Arundell, Hamilton and Daniell. The most remarkable ruins are those of Termessus, Cremna, Sagalussus, Sedge, a large and wealthy city in Strabo's time, and Antioch which Paul visited.

Pis'til (in plants), a term of somewhat indefinite application, inasmuch as it may consist of one carpel or of several carpels organized together. In the former case the pistil is spoken of as simple, in the latter case as compound. In other words, any organization of carpels which appears as a single organ with one ovary is a pistil. See FLOWER.



PISTIL

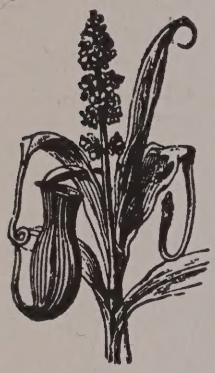
(*a*) style; (*b*) stigma; ovary hidden in flower.

Pis'tol. See REVOLVER.

Pit'cairn' Island, a solitary island in the Pacific between Australia and South America, area two square miles. It owes its celebrity to its being the dwelling place of the Mutineers of the Bounty. The British ship *Bounty* was sent out by the government for the purpose of carrying breadfruit trees to the West Indies to be transplanted. A short time after leaving Tahiti 25 of the crew mutinied. The commander, Bligh, with a number of his officers, was set adrift in a launch. He made out to reach the Dutch East Indies. The mutineers at first went back to Tahiti. In 1790 nine of these mutineers, with six Tahitian men and a dozen women, sailed to and settled on Pitcairn Island. At the end of ten years John Adams was left alone with eight or nine women and several children, and from them the present inhabitants are descended. Adams set about the Christian education of the company. Nothing was known of them till 1808, when the American ship *Topaz*, Captain Folger, discovered them. Not until 1814 did a British vessel touch at the island. In 1839 Pitcairn was annexed to Britain. In 1856 nearly 200 were transferred to Norfolk Island, but a number returned. The people (who chiefly are Seventh-Day Adventists) are virtuous and contented, and choose their own pastor and magistrate. The island raises coffee, arrowroot, yams, bananas, pineapples, sweet potatoes, pumpkins, oranges and melons; it also contains about 200 wild goats. Population 169.

Pitch. In mechanics pitch is used to denote the distance between two successive threads on a screw. In acoustics pitch is used to denote one of the three distinguishing features of any musical tone. The pitch of a note depends upon the number of vibrations per second which produce this note; and the numerical value of the pitch is the number of vibrations per second or the *frequency* of the note. See ACOUSTICS.

Pitch, a black resinous substance, is obtained from the tar of coal or of wood by the application of heat at low temperatures, the heat driving out the volatile naphtha or spirit. In the production of pitch the fire must be withdrawn before the heat of the distilling vessel reaches the point at which coke or carbon will be produced. Pitch is also obtained from natural petroleum, bone-tar and stearine-residues. The last two are valued by varnish and turpentine makers. Wood-tar pitch is much used to protect timber from insects and the weather; coal-tar pitch is used in the manufacture of black varnishes for coating iron and for making lampblack. In Persia it is prepared from goat and sheep dung. Burgundy pitch, produced in Finland, is a drug much used as a medicine.


PITCHER-PLANT

Pit'cher-Plants, those whose leaves form tubes or urns of various shapes, which contain water and to which insects are attracted and drowned. The common pitcher-plants of the temperate regions are a species of *Sarracenia*, which grow in swampy areas. In the tropics striking illustrations of pitcher-plants are found among the various species of *Nepenthes* and their allies, in which urns of various shapes are developed swinging at the ends of tendrils. See CARNIVOROUS PLANTS.

Pith, a term which has both a general and a special application. In the former case it applies to any loose, spongy tissue in plants. Strictly, however, it means the spongy tissue within the vascular cylinder of gymnosperms and dicotyledons. The tissue is parenchyma (which see), and it is apt to die so early, that the pith of ordinary experience is a dead and empty mass of cells. The pith of ordinary commercial use is obtained from the elder.

Pit'man, Sir **Isaac,** a British educator and the father of modern shorthand, was born at Trowbridge, Wiltshire, England, Jan. 4, 1813. He was educated at the Normal College near his home, and himself became the master of a school at Barton-on-Humber in 1832. He published his first studies of the art which was to make him famous in a volume entitled *Stenographic Shorthand* (1837). A few years later he put forth *Phonography or Writing by Sound.* Such was the general acceptance his system found, that little remains of earlier attempts. In 1843 he founded the Phonetic Society, and soon after began the publication of the weekly *Phonetic Journal*. He issued many textbooks upon phonography, and his system was introduced into the United States in 1847. He was knighted in 1894, and died on Jan. 22, 1897. His brother, Ben Pitman, settled at Cincinnati about 1850, and made that city the headquarters for the publication of works similar to those printed by Isaac in the Old World. His system differs slightly from that of his brother, but essentially they are one. See SHORTHAND.

Pitt, William, Earl of Chatham, sometimes styled Pitt the Elder, one of the greatest of all English orators and statesmen was born at Westminster, Nov. 15, 1708. He was educated at Eton and Oxford, and entered Parliament in 1735, where he took sides against the king and led the young Whigs, known as patriots, in opposition to Walpole, then at the head of affairs. Though deprived of his commission, his influence increased rapidly both in and out of the house of commons. Walpole was driven from power in 1742, and, though the king hated Pitt, he found it necessary to permit his return to the government service. Some wealthy admirers of Pitt's oratory and patriotism left him large sums of money, and on the dismissal of Fox Pitt became secretary of state. While Pitt was in power, success returned to the British arms. French armies were defeated everywhere by Britain and her allies — in India Africa, Canada, on the Rhine — and the few ships left her were driven from almost every sea. But Pitt, the prime mover of all these brilliant victories, found himself compelled to resign on the accession of George III, when the British government adopted a vacillating policy. But he did not cease to take an interest in public affairs. He spoke strongly against the arbitrary and harsh policy of the government toward the American colonies, and warmly urged an amicable settlement of the difficulties. But when, America having entered into treaty with France, it was proposed by the duke of Richmond to remove the ministers and make peace on any terms, Chatham, sick though he was, came to the house of lords. In a powerful address he protested against the implied prostration of Britain before the throne of the Bourbons, and declared that war, with whatever issue, would be preferable to the proposed terms of peace. This address secured a majority against the motion, and the war was continued. But it was the orator's last effort, for his physical powers suddenly failed, he fell back into the arms of his friends, and was carried from the house by his son William, who in less than five years was himself prime minister.

Chatham died in Kent on May 11, 1778. He was buried in Westminster Abbey, where a statue was erected to his memory.

Pitt, William, a noted English statesman and the second son of the great Earl of Chatham and of Lady Hester Greenville, was born on May 28, 1759, at Hayes in Kent, while his father was in the House of Commons and the most honored man in England. Owing to ill-health he was educated at home, his father carefully superintending his studies and training him in those lines which would best fit him for a brilliant career in Parliament. To this was due that wonderful command of choice and accurate English which Pitt possessed above all the orators of his time. He entered Parliament on January 23, 1781, and his first speech made a deep and lasting impression upon his countrymen. Burke said, "He is not a chip off the old block, but the old block itself." A member of the opposition said to Fox, "Pitt will be one of the first men in Parliament." Fox replied, "He already is the first." Although but twenty-three years of age and poor, he refused the office of Vice-treasurer of Ireland, saying he would accept nothing but a seat in the cabinet. This speech caused wide-eyed astonishment at the time, but three months later he was seated in the cabinet as Chancellor of the Exchequer. A year later George III urged him to act as Prime Minister and chose his associates, but with rare judgment and self-restraint Pitt declined the dazzling offer. Upon the speedy fall of the coalition ministry then formed, however, with Fox and North as joint Secretaries of State, the king arbitrarily appointed Pitt Chancellor of the Exchequer and first lord of the treasury. The best judges in the political world then considered his position hopeless, and foretold a ministry of shorter duration than even the last three had been. He was opposed by North, Sheridan and Burke, who united against him, but his dauntless courage, skill and firmness won, and on March 25, 1784, Parliament was dissolved and Pitt, only twenty-five years of age, was elected Minister.

In 1801 William Post Pitt resigned his office because of the king's adamant refusal to accept or support his Catholic Emancipation measures. Pitt, however, supported the new government under Addington in its efforts to effect a permanent peace with France. There resulted in 1802, the Treaty of Amiens. Upon the declaration of war made on May 16, 1803, by England against France, Pitt again came to the fore to aid his country. His criticism of the weakness of the existing government led to his again entering the service of England by becoming Prime Minister on May 10, 1804. It was during Pitt's government that the third coalition against France was formed. His greatness was loudly proclaimed at the victory of Trafalgar. In 1805, however, upon the defeat of Austria and Russia at Austerlitz, Pitt's government fell into disfavor.

William Pitt was one of England's most powerful prime ministers and held sway for twenty years. He died at Putney on January 23, 1806, and was buried beside his distinguished father in Westminster Abbey.

Pittsburg, a city and railroad center in Crawford County, Kansas, is situated in the southeastern part of the State, about fifty miles east of Independence. It is served by the Atchison, Topeka and Santa Fe; the Kansas City Southern; the Missouri Pacific, and the St. Louis and San Francisco railroads. There are rich coal fields and mineral deposits, coal mines and zinc works in the immediate vicinity. The principal industries include flour mills, clay works, packing houses, grain elevators, brick yards, sewer pipe plants, lumber mills, and machine shops. The railway shops of the Kansas City Southern line are situated here. Pittsburg has excellent schools and churches. A State normal school in which manual training is a prominent feature, is situated here. In 1930 the population was 18,051.

Pittsburgh (*pĭts'bûrg*), the "Gateway of the West," the second largest city of Pennsylvania, the tenth largest city in the United States, and the seat of Allegheny County, is situated at the junction of the Allegheny and Monongahela rivers, 270 miles northwest of Philadelphia. This junction forms the Ohio River which affords water transportation to the Mississippi and Missouri rivers. The city extends over an area of forty-one square miles, with a water-front forty miles long.

Description. Pittsburgh occupies a picturesque site, on land that rises steadily from the flat river district to the hills, reaching its highest point in Herron Hill, which is 1,200 feet above sea level. The southern shore of the Monongahela rises steeply in a rocky bluff hundreds of feet high, on which is the North Side District, formerly the city of Allegheny, overlooking the remainder of Pittsburgh. There are six parks within the city limits, the largest of which is Schenley Park which includes 440 acres. Highland Park has important zoölogical gardens, and there is an astronomical observatory in Riverview Park. The other city parks are Carrick Park, Frick Woods and West Park. Within the county boundaries are North County Park and South County Park, each of which extends over 2,000 acres. Forbes Field is an important athletic field used for baseball and football games, and Pitt Stadium, which seats 62,000, is used for football and track events. There are thirty-six playgrounds and recreation centers. The Point, surrounded on three sides by water and on the east by hills, is the chief business section of the city, with the manufacturing establishments occupying the water-front. The principal residential sections are among the hills of the East End, in the South Hills, and on the North Side.

Transportation. Pittsburgh is naturally the center of water-borne trade, located as it is in the heart of an 8,000 mile navigable river system. By means of canals, the city has a nine-foot navigation route to the Gulf of Mexico during the entire year, through the Ohio and Mississippi Rivers. Ohio River traffic has doubled since the World War, and Pittsburgh is consequently a very important point in the inland navigation system of the United States. The Monongahela river is navigable for 100 miles south, to the coal-fields of West Virginia. There are fifty-four miles of harbor frontage afforded by the junction of the three rivers on whose shores the great city has risen. Five major railroad systems enter Pittsburgh, and a network of street cars, motor buses and interurban trains reach every important community in southwestern Pennsylvania. Pittsburgh is the focal point of the 800-mile highway system, and is also entered by three United States highway routes. The city is served by six land airports, and a water airport in the heart of downtown Pittsburgh.

Buildings. Pittsburgh is a city of churches. More than five hundred beautiful structures are scattered over the city, which is the seat of a Roman Catholic and a Protestant Episcopal bishopric, the cathedrals of which are among the notable buildings. Other structures which are prominent architecturally are the Allegheny County Court House, the United States Custom House and Post Office, the Carnegie Library and Institute, the Soldiers' and Sailors' Memorial Hall, the Frick Building, the Masonic Temple, the United States Arsenal and the Armory. The University of Pittsburgh campus has several outstanding buildings. Other important educational institutions of the city are Carnegie Institute; the Pennsylvania College for Women; Duquesne University, and a number of theological seminaries and academies. The United States Bureau of Mines Testing Station is situated here. There are some notable buildings in use as hospitals, sanitariums and charitable institutions.

Industry. The great iron, steel, coal and coke industries of this city have given to it various names, such as "City of Steel," "The Smoky City," "The Workshop of the World," and "The Hearth of the World." Pittsburgh is the home of the world's only manufacturer of forged steel, steel sheets; the world's largest food products company of its kind; the world's largest manufacturers of aluminum, air brakes, plate glass, window glass, refractories, plumbing fixtures and rolling mill machinery. The world's second largest independent steel company and electrical equipment company are located in Pittsburgh, as are America's largest manufacturer of bolts, nuts and rivets; America's largest independent oil company; commercial coal producer, and wrought iron pipe company. One-sixth of the nation's glass industry is located in the Pittsburgh district. Other important industries include iron and steel, bakery goods, slaughtering and meat packing, foundry and machine shop products, petroleum refining, confectionery, brass, bronze and other non-ferrous alloys, paint and varnish, leather and rubber goods, ice, chemicals, clay products, and glass. Pittsburgh is the center of the lumber industry of western Pennsylvania, and is in a rich farming district from which there is considerable trade in vegetables.

Population. According to the census of 1930, the population of Pittsburgh is 669,817, with a metropolitan area having a population of 1,930,111. Of the total population of the city, the native whites number 73.1 per cent, foreign born whites 16.3 per cent, and Negro 8.2 per cent. The foreign born represent twenty different nations, chiefly Italy, Germany, Ireland and Poland, from which there were respectively 18,154; 14,409; 11,246, and 15,251 persons in 1930.

Government. The Legislature granted to Pittsburgh in 1911 a new and greatly improved charter. The city is now governed under the "Pittsburgh Plan" by a unicameral form of government. The council consists of nine members. The city is famed for its excellent and very modern educational system. The county bar possesses the best equipped law library of its kind in the United States.

History. In 1754 the French built Fort Duquesne on the side of Pittsburgh, at the far extremity of the Point. In 1758 the English under General Forbes captured the fort, although the French burned the buildings. George Washington suggested that the name of Duquesne be changed to Pitt, in honor of William Pitt, then Prime Minister to England. Consequently, this defense became Fort Pitt. General Bouquet erected a blockhouse in 1763 which remains standing to this day. Pittsburgh was laid out around it in 1764. Fort Pitt was besieged unsuccessfully during Pontiac's War, and was used constantly during the Revolution. In 1791 Pittsburgh became a county town, a borough in 1804, and a city in 1816. Virginia contested its possession with Pennsylvania, but the decision was in favor of Pennsylvania in 1785. A great fire in 1845 destroyed one-third of the city. In 1877 Pittsburgh was the site of the first great American railroad strike. In 1908 was celebrated the sesqui-centennial of the founding of Pittsburgh. In 1909, the consolidation with Allegheny having been effected, the first Mayor of the Greater City of Pittsburgh was elected. In recent years there has been much improvement of labor and social conditions. The problem of smoke prevention has been investigated, and the smoke nuisance abated seventy-five per cent since 1911.

Pittsfield, a city and the seat of Berkshire County, Massachusetts, is situated on a plateau 1,037 feet in altitude and surrounded by the Hoosac and Taconic Mountains. Pittsfield possesses natural beauties rarely surpassed. Its great beauty has attracted people of wealth and taste who have built costly residences here. It contains a marble courthouse, a handsome athenæum, an excellent museum and beautiful schools. Its manufactures include woolen goods, silk, cotton goods, shoes, electrical goods and paper mills. The city was named in honor of William Pitt and was settled in 1761. In 1930 the population was 49,677.

Pittston, a city in Luzerne County, Pennsylvania, is situated on the Susquehanna River and in the center of the rich anthracite region of northeastern Pennsylvania. It is the seat of St. John's Academy. Its manufactures, which have the advantage of abundant and cheap fuel, include machine-shops, planing, knit goods, flour and paper-mills, stove and steel-range works, terra cotta works, ladies' underwear factory, dye-works and pressed-brick works. West Pittston, across the river and connected with Pittston proper, is the chief residential part of the city. Pittston also has electric connection with Nanticoke, Plymouth, and Wilkes-Barre. It is also served by four railroads. Pittston was named after William Pitt, and was settled about 1770. The population in 1930 was 18,246.

Pius V, originally named MICHELE GHISLIERI, was born of poor parents at Bosco near Milan in 1504. At the age of fourteen, he entered the Dominican order. His merits were recognized by Pope Paul IV, who appointed him Bishop of Sutri and Nepi in 1556, and Cardinal in the following year. He was chosen Pope in 1566 and labored to restore discipline and morality at Rome. Pope Pius prohibited bull-fights and other objectionable amusements, and regulated the taverns. He also zealously maintained the inquisition, and sought to suppress heresy with a strong hand wherever it was found. He issued the bull of excommunication against Queen Elizabeth in 1570, and was a warm friend of Mary, Queen of Scots. The most important event of his pontificate was the expedition which he organized in connection with Spain and Venice against the Turks, which resulted in the great naval victory of Lepanto, on October 7, 1571. He died in the following year, and was canonized by Clement XI in 1712.

Pius VI, originally named GIOVANNI ANGELO BRASCHI, was born at Cesena, Italy on December 27, 1717. Upon the death of Clement XIII in 1775, he was chosen to the pontificate. His administration was enlightened and judicious, and to him Rome owed many substantial improvements. Soon after his accession, however, he was involved in serious conflict with Emperor Joseph of Austria and with Leopold of Tuscany, by whom he was deprived of a considerable portion of his supremacy. He excommunicated Talleyrand and refused to accept the French civil constitution for the clergy. Soon afterwards there developed the French Revolution which resulted in the confiscation of all church-property in France. In 1797 peace was secured by the treaty of Tolentino; but new causes of contention soon arose, and in 1798 the French marched upon Rome and took possession of the castle of St. Angelo. Pius was called upon to renounce his temporal sovereignty, and upon his refusal to do so was imprisoned and carried to Florence. During the threatened advance of the Austro-Russian army in the following year he was transferred to Grenoble and thence to Valence on the Rhone, where he died on August 29, 1799. He is of particular interest to Americans, because he created the See of Baltimore, the first Roman Catholic diocese in the United States.

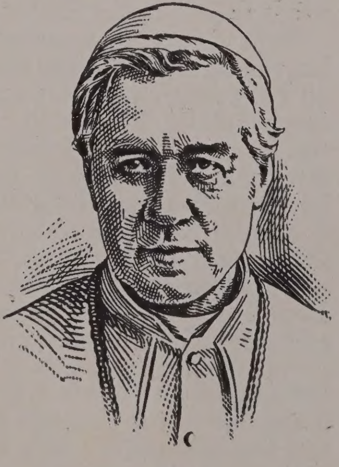
Pius VII, originally Gregorio Luigi Barnaba, was born at Cesena, Italy, on August 14, 1742. He was Count Chiaramonti, and became pope in 1800. Rome, which had been occupied by the French for two years, was restored to the papal authority, and in the next year the French troops were withdrawn from the city. In 1804 Napoleon compelled Pius to come to Paris to consecrate him as emperor. He was well-received, but in less than six months after his return to Rome French troops seized Ancona, and in 1809 General Miollis entered Rome and took possession of the castle of St. Angelo. The usurpation was consummated in the following year by a decree annexing Rome and all the papal territory to the French empire. Pius issued a bull of excommunication against Napoleon, and was promptly removed to Grenoble, and later to Savona and Fontainebleau. After the downfall of Napoleon, the Congress of Vienna restored his territories, and on May 24, 1814, he re-entered Rome. The remainder of his reign was devoted to wise measures of internal administration. He was especially active in suppressing brigandage and secret societies. He restored the Jesuits and concluded a number of concordats with European courts. Throughout his life Pius was a model of gentleness, benevolence and Christian charity. He died on August 20, 1823.

Pius XI, originally named ACHILLE RATTI, was born in Desio, Italy, in 1857. He was ordained priest in 1879, and became professor of dogmatic theology and sacred eloquence in the seminary at Milan in 1882. In 1888 he joined the staff of the Ambrosian Library, of which he became the head in 1907. He was appointed prefect of the Vatican Library in 1914. Four years later he went to Poland as Apostolic Visitor. In 1919, he became Papal Nuncio and Archbishop of Lepanto, and in 1921 was made Cardinal Archbishop of Milan. In 1922, he succeeded Benedict XV as Pope Pius XI.

Pope Pius XI concluded concordats with Latvia, Bavaria, Poland and Lithuania, by 1927. In 1925, many pilgrims came to Rome for the 220th Jubilee Year, and the Pope proclaimed the Feast of the Kingdom of Christ for the last Sunday in October. On February 11, 1929, he signed a treaty with Italy, part of a larger concordat, which ended the fifty-nine year imprisonment of the Pope, and made him temporal sovereign in "Vatican City." In 1931 Pope Pius XI issued an apostolic letter urging relief for the unemployed and victims of the economic depression, and opposing the drive for armaments. This was written on October 2, the day of the Feast of the Guardian Angels, and was especially a plea for the children, "the little ones who have asked for bread, and there was none to break it unto them."

Pius IX, originally Giovanni Maria Mastai-Ferretti, was born at Sinigaglia, Italy, May 13, 1792. In 1840 he became a cardinal, and on the death of Gregory XVI in 1846 was elected to succeed him. He avowedly was the leader of the reform party. In March, 1848, he published his scheme for the government of the papal states by means of two chambers, one nominated by the pope and one chosen by the people. But the revolutionary fever of 1848 spread too fast for a reforming pope, and on Nov. 15 his minister was murdered in broad daylight. A few days later the pope himself escaped to Gaeta, from which he issued a remonstrance to the various sovereigns of Europe. In April, 1849, a French expedition was sent to Civita Vecchia, and in July General Oudinot took possession of Rome, Pius himself returning and resuming his authority in the following year. After this his policy was the reverse of what it had been, and to the end of his life he continued an unyielding conservative. By a bull, issued in 1854, he decreed the Immaculate Conception of the Virgin Mary as a doctrine of the church. But the most important event of his pontificate was the Vatican Council, at which bishops from all parts of the world assembled in December, 1869, and continued in session until July, 1870. This council first formally proclaimed the doctrine of the papal infallibility whenever the head of the church issues a decree on a subject of faith and morals to the universal church. For several years previous the pope's temporal authority had been maintained only by French bayonets. When the garrison at Rome was withdrawn, on the outbreak of the war with Germany in 1870, the soldiers of Victor Emmanuel entered Rome, and for the remainder of his days the pope lived a voluntary prisoner within the Vatican, only his spiritual power remaining. He died at Rome, February 7, 1878, and was succeeded by Leo XIII.

Pius X, originally named Giuseppe Sarto, was born of humble parents at Riese, Italy, on June 2, 1835. He pursued his elementary studies at Castel Franco near Venice, and was later enabled to continue his higher education elsewhere. He was consecrated to the priesthood at 23; and became vicar-general of Treviso in 1875; bishop of Mantua in 1884; and cardinal in 1893. Shortly afterward he was made Patriarch of Venice, and on Aug. 4, 1903, he was elected pope. Free from ambition and filled with a passion for souls, he had a gift for organization and was full of zeal. His schools and his work for societies made him known throughout Italy. He was ardent for missions and preaching. His rule as pontiff was marked by his abolition of the veto of Austria, France and Spain on the election of the pope; by his stanch advocacy of the Gregorian chant and opposition to secular music in the services of the church; and by the separation of church and state in France. He died Aug. 20, 1914.



PIUS X

Pius XI, (Achille Ratti), was elected pope on February 6, 1922, to succeed Benedict XV. He was born May 30, 1857, at a little village near Milan, Italy. He was educated for the priesthood, although his father had originally intended him for a lawyer and had persuaded him to study for that profession. In 1888 he was appointed one of the college of doctors of the Ambrosian library at Milan, and in 1907 became chief librarian. He attained so high a reputation there that in 1910 he was called to Rome to become vice-prefect of the Vatican library, and from 1913 to 1918 was prefect. In the spring of the latter year Pope Benedict sent him to Poland as papal nuncio, and in June 1919 he was created archbishop of Lepanto. Two years later he was appointed archbishop of Milan, and in June, only seven months before his election as pope, was made cardinal.

Pizar'ro, Francis'co, the conqueror of Peru, was the illegitimate son of a Spanish colonel of infantry, and was born about 1478. He never learned to read and write, but entered the army at an early age and served under Gonsalvo di Cordova, the Great Captain, in Italy. He also was one of Balboa's party that discovered the Pacific Ocean, and soon after this became a resident of the Isthmus of Panama, on the Pacific coast. From this point, in connection with Diego de Almagro, another old soldier, he made one fruitless expedition in 1526 for the conquest of Peru. Returning to Spain, he received a commission from the king for this enterprise in 1529; Pizarro was given the title of captain-general, while Almagro received the title of marshal. Pizarro sailed from San Lucar on January 19, and from Panama the following year, with three vessels, containing less than 200 men and about 40 horses. Almagro was to follow with re-enforcements. Landing at Tumbez, the Spaniards commenced the march inland in May, 1532, and in November entered the city of Cajamarca. The Inca Atahualpa, being on his way to Cuzco, the capital of his empire, was captured and put to death by Pizarro, who first extorted eight million dollars for his ransom. Pizarro then marched to Cuzco, and set up the young

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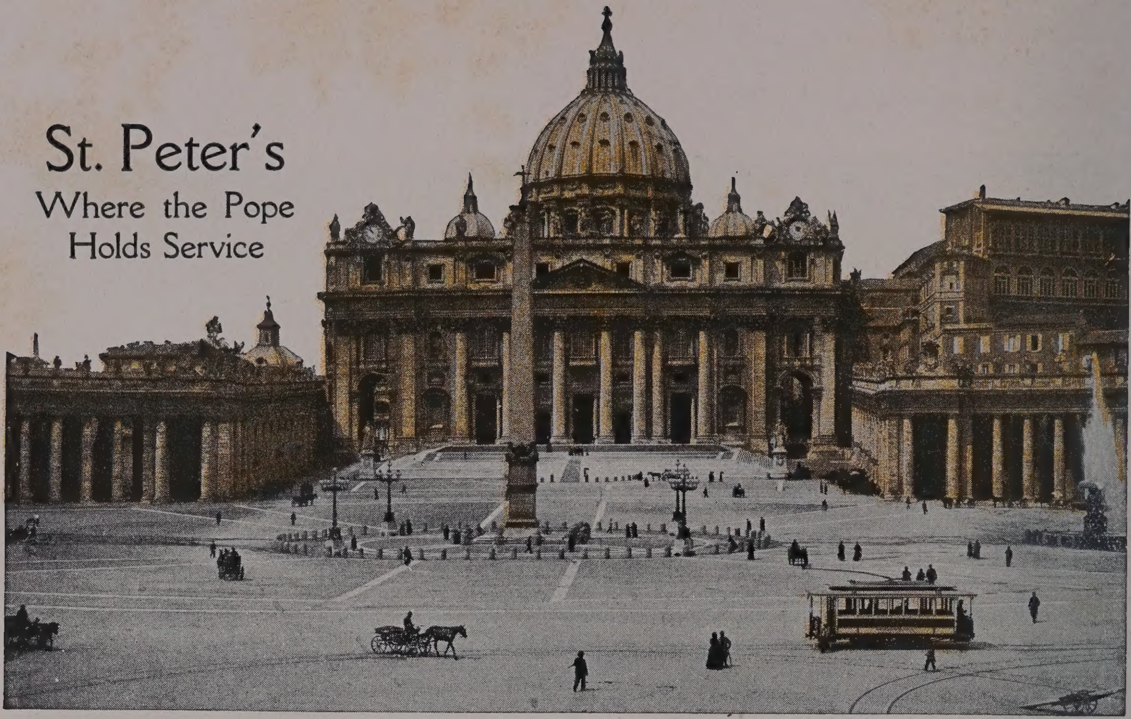
HIS HOLINESS, POPE PIUS XI

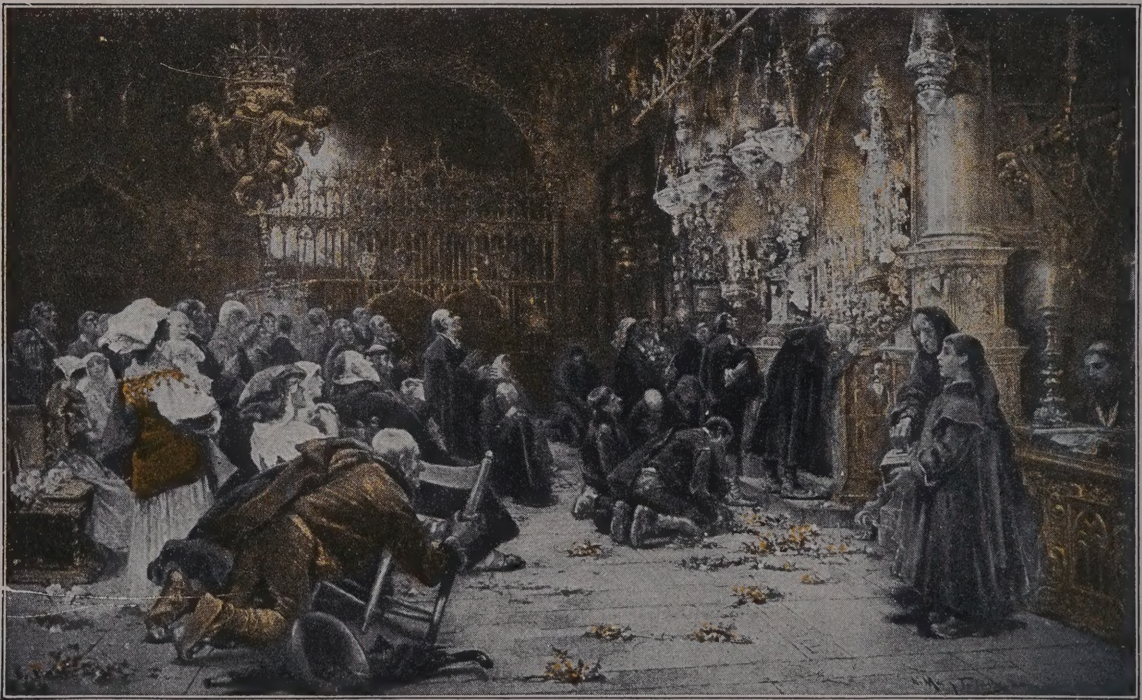
St. Peter's

Where the Pope Holds Service



ST. PETER'S, where the Pope holds service, is the world's largest and most magnificent church. It stands on the right of the Tiber near the Vatican in a space in the form of an ellipse. From it extend the huge colonnades or covered drives which you see. The dome of the capitol at Washington is copied from the dome of St. Peter's, the erection of which was supervised by Michelangelo.

Now imagine yourself in this wonderful building looking at the group by the famous Spanish painter, Mas y Fondevila, "Worshippers at St. Peter's." With what skill the artist has brought out the lights and shadows in this vast palace of religion and art and emphasized the motherhood of the church which knows no distinction of rank or class. What a variety of figures and attitudes—the young Italian mother with her babe, one old man with his head bowed upon his cane, another, rheumatic and in ragged shoes holding to the chair to prevent himself from falling, as he bows in worship.



Worshippers in St. Peter's, by Arcadio Mas y Fondevila (Spanish b. 1850)

Inca, Manco, as nominal sovereign of the empire, being careful to retain the real power in his own hands. In 1535 he founded Lima as the capital of his new government. Two or three years later a fierce quarrel arose between Pizarro and Almagro, the latter claiming that he was the lawful governor of Cuzco and that he had not received his full share of the honors and riches to which he was entitled. This contest almost assumed the proportions of a civil war, and resulted in Almagro being captured and beheaded by Pizarro. But Almagro's followers, driven to desperation by the manner in which they were treated by Pizarro, formed a conspiracy against him. On June 26, 1541, he was attacked in his house and assassinated, his body being buried in the cathedral by stealth and at night.

Plague, a term applied during the middle ages to all fatal epidemics but now restricted to a contagious fever prevailing at certain times and places epidemically. The general symptoms resemble those of other fevers — shivering, rise of temperature, pain in the head, back, limbs etc. Bleeding from the lungs, though rare in recent epidemics, was formerly regarded as a characteristic symptom of the "black death" in its most virulent form. About the second or third day the most distinctive features of the disease present themselves. These consist of glandular swellings, usually in the neck, armpits or groins; these generally break and lead to prolonged suppuration. The cause of the epidemic has never been determined. It certainly is very infectious, and the infection may be conveyed by clothes, bedding etc. as well as by direct contact with the sick. It also is the most destructive of all epidemics. The black death of 1348-50 is believed to have destroyed more than half the population of Europe. The first extensive outbreak of this disease was in the 6th century of our era, and devastated the whole Roman empire. It is supposed to have originated in Lower Egypt; but from this time frequent epidemics occurred in Europe. The last outbreak in England was in 1665, and was called the Great Plague of London. Nearly 100,000 persons perished in London alone during its ravages. Since the end of the 17th century it has only twice visited western Europe; in 1704-14 it spread from Russia and Hungary as far as Sweden, Denmark and Bavaria; and in 1720-22, being introduced into Marseilles from Syria, it destroyed almost half the population there and spread through Provence. The last cases known in Egypt were in 1844, and since that date it has occurred more than once in Arabia, Tripoli, Persia, Mesopotamia and Russia.

Plain'field, N. J., an attractive city in Union County on the Central Railroad of New Jersey, ten miles north of New Brunswick and 25 west of New York City. It has many charming residences and is tastefully laid out. It has a public library, art-gallery, Muhlenberg Hospital and other civic and philanthropic institutions, and its school-system fits pupils for college entrance. Its manufatures embrace silks, gloves, safes, dynamos and other machines and a machine-tools works, together with large establishments for the manufacture of printing-presses. Population, 31,000.

Plane'tree, the oriental plane, a native of Greece and the east, was planted by the Greeks and Romans as an ornamental tree, and for centuries the youth of Greece assembled under its shade in the groves of academies to receive lessons in philosophy. It is still planted for shade and ornament in the south of Europe, and there are no finer trees in London than its plane.

Plan'ets. If one observes the sky night after night he finds that practically all the stars maintain their relative positions; but there are certain heavenly bodies, besides the sun and moon, which form a striking exception to this general rule. There were five of these bodies known to the ancients who called them planets, the Greek word for wanderers. To these five bodies had been given the names of Mercury, Venus, Mars, Jupiter and Saturn. Copernicus, by placing the sun at the center of the solar system, showed that Tellus, the earth, also belongs in this group. On March 13, 1781, Sir William Herschel discovered what he at first thought was a comet, but which within a year proved to be another planet, the one we now call Uranus. On September 23, 1846, an eighth planet, Neptune, was found by Galle at Berlin almost exactly at the point in the heavens where it had been predicted by Leverrier (*q. v.*) in France and by Adams in England, a discovery which is justly celebrated as the most brilliant achievement of modern astronomy. Besides these, nearly 500 smaller planets called asteroids were discovered during the 19th century. See ASTRONOMY.

The following table, giving the distances and periods of the various planets, is taken from Young's *General Astronomy:*

NAME	DISTANCE FROM SUN	SIDEREAL PERIOD
Mercury	0.387	88 days
Venus	0.723	224.7 "
Earth	1.000	365¼ "
Mars	1.523	687 "
Mean Asteroid	2.650	3 to 8 years
Jupiter	5.202	11.9 years
Saturn	9.539	29.5 "
Uranus	19.183	84.0 "
Neptune	30.054	164.8 "

It will be observed that the distance from the sun is given in terms of the distance of the earth as a unit. The relative sizes of the planets and the sun are well-shown in the accompanying figure.

For the laws which describe the motion of the planets about the sun see Kepler and Newton.

Concerning the individual planets it may be noted that

1. Mercury, which is nearest the sun, has the least diameter, the least mass and the greatest density of all the planets. Its density may be remembered from the fact that it is almost exactly that of the metal mercury, being 12½ times that of water. The diameter of this planet is about 3,000 miles. No satellite has been discovered for Mercury.

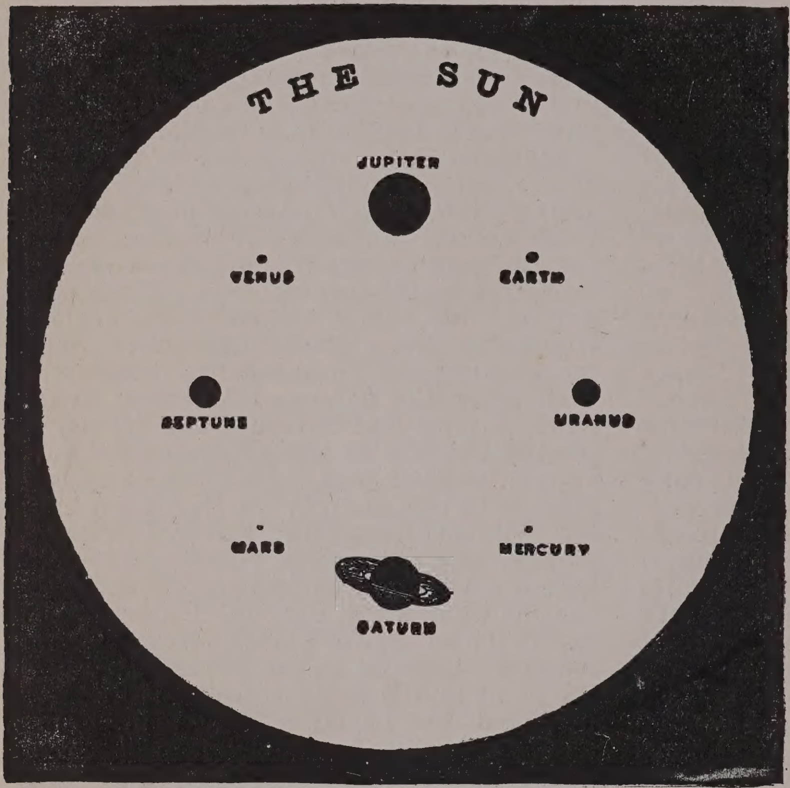


DIAGRAM SHOWING COMPARATIVE SIZES OF THE SUN AND PLANETS

2. Venus has a diameter of 7,700 miles and a density 0.86 that of Earth, so that in size, surface, gravity she is not very different from our own planet. No satellite is known.

3. Earth. See Earth.

4. Mars has a diameter of 4,200 miles, and a density which is 0.73 that of Earth, so that bodies at the surface of Mars weigh only 0.38 what they would at the surface of Earth. Two satellites of this planet were discovered by Professor Hall at Washington in August, 1877. These two moons, *Deimos* and *Phobos*, are exceedingly minute, being only 7 and 5 miles, respectively, in diameter. The surface of Mars is covered with interesting markings.

5. Asteroids. See Asteroids.

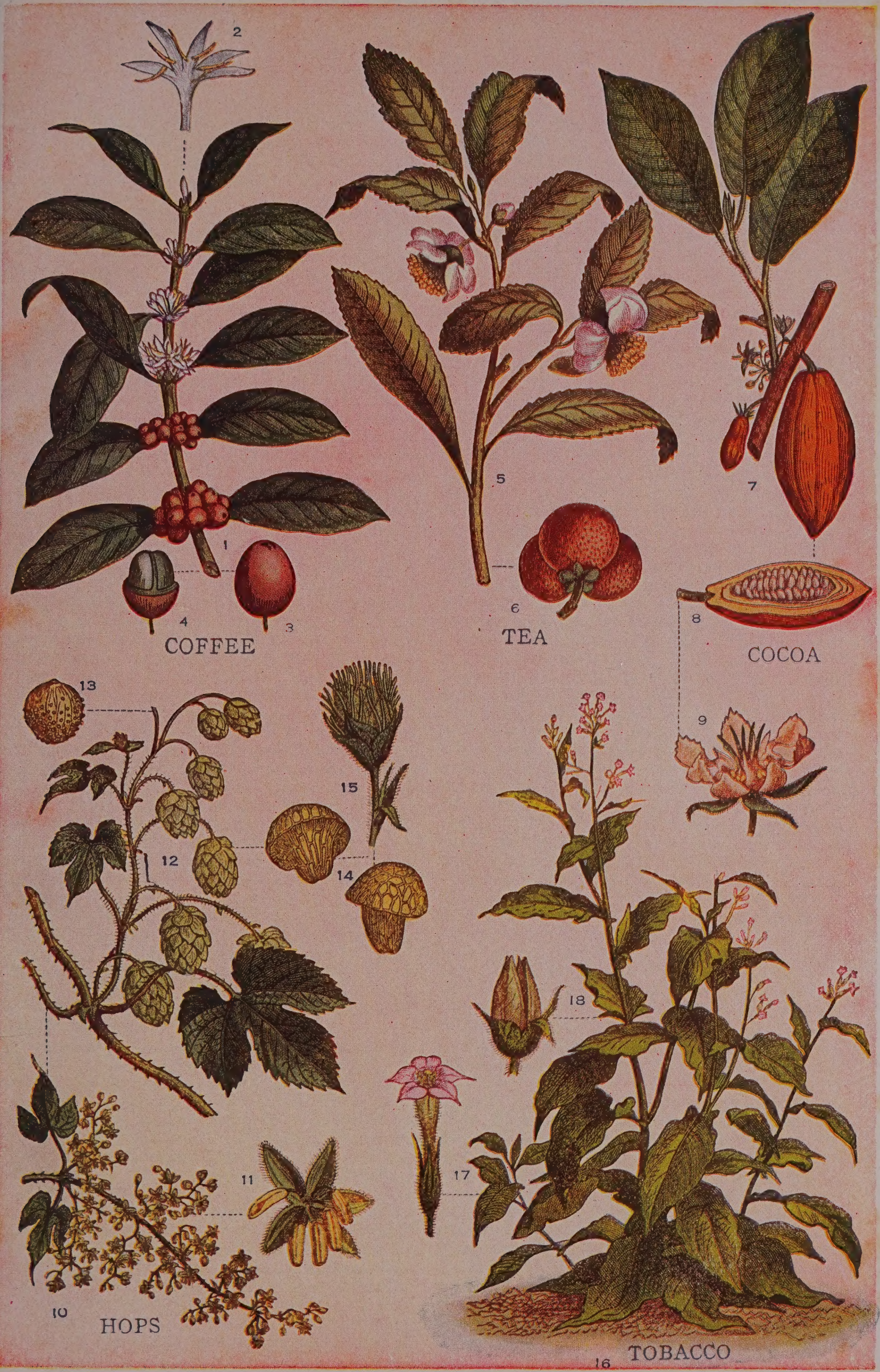
6. Jupiter, the largest of all planets, has a diameter of 86,500 miles; and, while its density is only one quarter that of Earth, its mass is 316 times as great, so that a body on the surface of Jupiter weighs more than twice as much as the same body at the surface of Earth. The surface of this planet exhibits some very characteristic markings, especially belts and spots, which lead to the opinion that Jupiter is a body of very high temperature compared with the other planets. He has five satellites, four discovered by Galileo and one by Barnard in 1892 at Lick Observatory.

7. Saturn, with its system of rings, is conceded to be one of the most superb objects in the heavens. Although the diameter of the planet is only 73,000 miles, the outer ring is no less than 168,000 miles across. Two rings had been known for a long while, but the third ring was discovered by Bond in 1850. Pierce and Maxwell have proved that these rings are made up of discrete particles and that the rings, therefore, are neither solid nor liquid. See Maxwell, James Clerk. Saturn has eight satellites discovered between 1665 and 1848.

8. Uranus, discovered by the older Herschel, has a diameter of 32,000 miles; but its density is only about one fifth that of Earth, so that, notwithstanding its enormous bulk, surface gravity there is only 0.90 that of Earth. It is accompanied by four satellites.

9. Neptune, the most distant member of the family has a diameter of 35,000 miles and a density one fifth that of Earth. At an average distance of 2,800 millions of miles from the sun, it is absolutely invisible at Earth, except by the aid of a telescope. It has one satellite, discovered almost immediately after the discovery of the planet itself. See Miss Clerke's *History of Astronomy* and Chambers' *Descriptive and Practical Astronomy*.

Plant'-Breeding, a term covering several processes of improving varieties of plants or of producing new varieties. It is done by selection or by crossing. Its purpose may be to produce fruits that are better flavored, to produce larger yields or to produce plants that are more resistant to disease, to pests or unfavorable climatic conditions. Selection is simply using such material for "seed" as to a greater or less degree shows the desired trait; or it is


2
1
4
3
COFFEE
5
6
TEA
7
8
COCOA
9
13
15
12
14
18
17
11
10
HOPS
TOBACCO
16

1—Coffee Branch, showing Fruit and Blossom. 2—Single Blossom. 3—Fruit. 4—Cut Fruit. 5—Tea Branch showing Blossoms. 6—Fruit. 7—Cocoa Branch, showing Fruit. 8—Opened Fruit. 9—Blossom. 10—Hops, Male Plant. 11—Male Blossom. 12—Female Plant. 13—Fruit. 14—Minute Grains (greatly enlarged) at base of petals. 15—Catkin of Female Flower. 16—Tobacco Plant. 17—Flower. 18—Fruit.

saving those seed-grown plants possessing said traits. The effect of failure to follow the first alternative is seen in the decreasing yield from year to year from selling all the large potatoes of a crop and planting only small ones. Potato-tubers are underground stems, and not "seeds," botanically speaking. Most true seeds tend to reproduce the traits possessed by their parents, *i. e.*, they tend to "breed true." By selection we get early maturing corn that ripens in the Dakotas to the Canadian boundary and wheat that needs but 15 inches of rainfall. Crossing means that the pollen-dust of one flower has been applied to the pistil or seed-bearing organ of another of a different variety. The result is a *hybrid*, which may or may not have desirable characteristics, and may or may not be able to transmit any of the desirable characteristics, as can be told only by observing later generations. Cross-breeding always implies selection, but not the reverse. Crossing induces a variation, selection fixes the type. But variations occur without any crossing that we are aware of. Desirable varieties of most fruit-trees, which must be propagated by other means than the seed, appeared we know not how. Thus the seedless orange was "discovered" in Brazil, the Delaware grape in central Ohio. See Holden's *Corn-Culture;* Bailey's *Plant-Breeding;* and U. S. Dept. of Agriculture reports.

Plantag'enet, a family that in 1154, in the person of Henry II, succeeded to the throne of England on the extinction of the Norman dynasty in the male line, and reigned till 1485, when the battle of Bosworth gave the crown to the house of Tudor. The name comes from *planta genista*, the broom-plant, which the Angevin ancestor of the family wore in his cap. The Plantagenet kings were Henry II, Richard I, John, Henry III, Edward I, Edward II, Edward III, Richard II, Henry IV, Henry V. Henry VI, Edward IV, Edward V and Richard III. See articles under these names. For the great struggle between rival branches of the Plantagenets see ROSES, WARS OF THE.

Plan'tain, species of *Plantago*, a genus containing more than 200 species, which are distributed everywhere, at least twenty plantains being known in North America. All have a common habit, a rosette-like cluster of basal leaves from the center of which rises a stalk bearing the more or less elongated dense spike of inconspicuous flowers. In the common plantain this spike is often said to resemble a rat's tail. Far the most common species is *P. major*, the dooryard plantain, which has received numerous other common names. Perhaps the next commonest form is *P. lanceolata*, known as ribwort, ribgrass and scores of old names.

Plasmo'dium, the naked, protoplasmic body of the slime-molds. It consists of numerous, fused, naked cells and, like a huge amœba, has the power of motion. See MYXOMYCETES.

Plas'ter of Par'is is gypsum (*q. v.*) prepared for use in the arts, the name arising from the fact that the most famous beds of gypsum in the world are those of Montmartre near Paris and that the product is shipped from that city. The plaster itself is merely gypsum, the natural bihydrated calcium sulphate, heated and ground fine. In this condition it constitutes a powder devoid of moisture, which has been driven off by heat. But upon the reapplication of water to the mass it rapidly assumes solid form again. This property renders the material invaluable to the designer, who can fill his molds with the moist, soft mass, and presently take it out, set in the form given by the matrix. Dentists use this material in taking casts of the jaws; decorators use it in ornamenting ceilings and cornices; sculptors use it in making the final model from which the marble statue is copied by skilled workmen who make that a profession.

Plas'tering, the process of covering walls, masonry or woodwork with material which is soft and plastic when applied, but becomes hard when dry. For interior walls a first coat of mortar, made of sand and lime mixed with hair, is generally used. The lime is slaked and, with the other material, is placed in a box. Water is added, and the whole is stirred and kneaded with a hoe until thoroughly mixed and a smooth mortar secured. A thick coat of this mortar is spread with a trowel on the surface of lath or screen, and is pressed in spreading in order that the mortar will be forced through the screen and clinch and hold as the material hardens. This first coat is roughened, to hold the second coat, which is applied when the first is thoroughly dry. The second coat is lighter, containing little or no sand or hair. It is planed smooth with a wooden board called a float. The third or setting coat is pure lime, or may be of plasterer's putty and plaster of paris. Cement, staff or stucco is used for exterior walls. See CEMENT.

Plata, Rio de la (*rē'ō day lä plä'tä*), a great estuary in South America between Uruguay and the Argentine Republic. It is about 150 miles long and at Buenos Aires 28 miles wide, but 140 miles broad at its mouth. The northern shore is steep and high, the southern low and flat. The branches of the Plata drain about 1,600,000 square miles, and the outflow, seen for 60 miles out at sea, is about 52,000,000 cubic feet per minute, a volume second only to that of the Kongo. See Sir Horace Humbold's *The Great Silver River*. See PARANÁ and PARAGUAY.

Platæa (*plȧ-tē'ȧ*), a city in Bœotia, on the borders of Attica and at the foot of Mount Cithæron, six miles from Thebes. In

480 B. C. it was destroyed by the Persians because the inhabitants had taken part with Athens in the battle of Marathon; but in the following year it was the scene of the victory won by Pausanias and Aristides over the Persians under Mardonius. During the third year of the Peloponnesian War, 429 B. C., it was besieged by a Theban and Spartan force, and heroically defended itself for more than two years until it was starved into surrender, the garrison of 200 men being put to the sword and the city razed to the ground. Such of the Platæans as escaped were hospitably received at Athens, and by the treaty of Antalcidas, forty years later, their children were allowed to go back and rebuild their city; they were again driven out by the Thebans; and half a century elapsed before the victory of Philip at Chæronea enabled the Platæans finally to return to their homes.

Pla′teau, Joseph Antoine Ferdinand, a distinguished Belgian physicist, was born at Brussels in 1801, and died at Ghent in 1883. He was educated at the University of Liège, and was professor of physics at the University of Ghent from 1835 to 1883. His most important contributions to science are along the two wholly different lines of subjective visual phenomena and capillarity. It was while engaged in the former study that he looked directly at the midday sun for 20 seconds in order that he might study its after-effects. One of these after-effects was that he became permanently blind in 1843. His work on surface-tension was carried on, under his direction, by his wife, son and distinguished son-in-law, Van der Mensbrugghe. These researches are contained in his *Statics of Liquids*, which has been translated into English by Smithsonian Institution. A more beautiful and ingenious series of experiments on surface-tension than those here described it would be impossible to find. Plateau is to be remembered also as the inventor of the thaumatrope.

Plat′ing consists in covering the surface of a metal with a coating of a more valuable metal. Many metals and alloys are plated with gold or silver, and iron is frequently nickel-plated. The operation is performed most frequently by placing the object to be plated in an appropriate solution and causing the metal to be deposited by means of an electric current. In silver-plating a bath of silver cyanide dissolved in potassium cyanide is commonly used, while an anode of silver supplies this metal as fast as it is deposited upon the objects forming the cathode. Copper and zinc may be deposited at the same time upon iron objects, thus producing brass plating. In most cases electroplated articles require rubbing or burnishing in order that they may acquire a brilliant luster. H. L. Wells.

Plat′inum is one of the "noble metals." It is generally found in small granules mixed with other metals, but sometimes in masses as large as a pigeon's egg. In rare cases pieces have been found weighing ten or more pounds. It is chiefly obtained from the Ural Mountains, although it has been found in Brazil, Colombia, California, Canada and Borneo. Platinum is the heaviest form of matter known, except iridium and osmium. It expands less by heat than any other metal, and, as it expands to about the same extent as glass, it is easy to fuse a wire of this metal into glass without causing the latter to break subsequently. Electric currents are thus led into the ordinary incandescent-light bulbs. On account of its power of resisting the action of acids it is of great service in chemical experiments, platinum capsules, crucibles and similar articles being found in every laboratory. Platinum is exceedingly malleable and ductile, but it melts only when subjected to the very highest heat. On this account it is in great demand for electrical as well as chemical apparatus, and the recent introduction of the platinotype process in photography has advanced the price very materially.

Pla′to, a distinguished Grecian philosopher, was born during the early years of the Peloponnesian War, most probably about 425 B. C. A vast amount of detail has come to us respecting his life, but most of it is very doubtful. According to one account Plato was born in Athens; according to another in Ægina. He came of an aristocratic family, his father boasting descent from the last king of Athens. In his youth Plato indulged in poetry, but, when he compared his compositions with Homer, he abandoned the muse entirely. Having, when about twenty, become acquainted with Socrates (*q. v.*), he devoted himself to philosophy. His companionship with Socrates continued until the death of the latter. Plato made no attempt to enter on a political career. He went to Megara, where he remained some time, and afterward visited Cyrene, Egypt, Italy and Sicily. On his way back to Athens Plato is said to have been sold as a slave in Ægina, but to have been ransomed by Anniceris of Cyrene. On his return to Athens about 388 B. C., he began to teach in the Academy, a grove in the western suburb of the city. There he gathered disciples, teaching mainly by questions and conversations, after the manner of Socrates. He twice visited Sicily, where he spent some time. Returning to Athens, he continued teaching and writing until 347 B. C., when he died.

The distinctive principles of the teaching of Socrates are the inductive method and the effort to get general definitions. When people spoke about persons or acts as just or beautiful, Socrates would ask: "What is justice?" "What is beauty?" and would test every definition by applying it to particular instances, content to remove misconception and error even when complete truth could not be obtained. This is the course pursued by Plato in his earlier dialogues; but in the *Theætetus* the Platonic Socrates asks the profounder question: "What is knowledge?" It is not sensation, for sensation alone gives us no objective certainty. It is not opinion, for opinion may or may not be true. A man only knows when he sees the reasons or causes of things; when he perceives facts as links in the chain of cause and effect. Man can only know that he knows, when he deals with that which is permanent and universal. What then is this? Plato's answer is found in his theory of ideas or forms. These are not material objects, but the everlasting essences, to be apprehended only by the reason; they are the substances of which material things are but the shadow. In our time they are generally described as mental concepts. The form of a statue is not the marble out of which it is carved, but the thought or conception of the sculptor, of which the marble is only an expression. In his *Republic* Plato elaborates his theory of knowledge and gives an illustration of it by picturing a majority of mankind as prisoners in a subterranean cavern chained with their backs to a fire, looking at the shadows thrown by it on the rocky wall and mistaking them for realities. The turning around of these prisoners to the light, their toilsome ascent up the steep slope to the mouth of the cave, the gradual training of their eyes to see the real things in the upper world and then finally looking up to the sun itself all represent the education of the philosopher. Education is turning around the eye of the soul to the light. Learning, according to the *Meno* and *Phædrus*, is recollecting; the soul in a previous existence has beheld the ideas or forms; and knowledge is possible because the mind does not acquire something alien to it but recovers what is its own.

Philosophy to Plato was not mere intellectual speculation, but a habit of mind and a manner of living. The highest of the ideas in his view was the good. While he does not accept the theory that pleasure is the good, neither does he agree with the cynics that all pleasure is evil. Pleasures are good or bad, high or low, according to the part of the soul to which they belong Plato accepts without proof the popular distinction of four cardinal virtues: wisdom, the virtue of reason; courage, the virtue of the spirited element; temperance (*i. e.*, moderation, self-control in general), the virtue of the lower parts in their relation to the higher; and justice, the virtue of the whole soul.

In Plato's *Timæus* the cosmos or order of the universe is the "one only begotten image of God," its father and creator. The Creator, being good, wished to make the world as nearly like Himself as possible; but no created or visible thing can be perfect. The material out of which the world was formed introduced evil into it. So also the Creator could not make the world eternal like Himself, and He therefore created time, "the moving image of eternity." See Professor Jowett's translation of Plato. The doctrine of immortality is the main subject of the *Phædo*, and as the soul, according to Plato's philosophy, had an existence before the body, it cannot be affected by the death and dissolution of the body.

Platt'deutsch' (*plȧht doitsh*) or **Low German,** the direct descendant of Old Saxon, is spoken to-day in different dialects by the peasantry of northern Germany from the Rhine to Pomerania. Low German softens the consonants, but avoids the deep sibilants of high German as spoken in the south, and has spoken grammatical rules. The low German dialects are more like English than the high German owing, among other things, to the total absence of the consonantal shifting which characterizes high German. Klaus Groth, Fritz Reuter (*q. v.*) and other writers have given it a high literary standing.

Platte (or **Nebras'ka**), a tributary of Missouri River, is formed by the junction of its northern and southern forks in western Nebraska. These forks, which rise among the Rocky Mountains in Colorado, are 800 and 500 miles long, respectively, but neither is navigable. The general direction of the Platte is eastward in a wide, shallow stream over the plains of Nebraska till it reaches the Missouri after a winding course of over 400 miles. With its forks it drains 300,000 square miles of territory, but is not navigable.

Platts'burg, N. Y., a village and the county-seat of Clinton County, is famous for two naval battles of the War of 1812, in the latter of which the American flotilla was completely victorious. The village is situated upon Lake Champlain, and is the port of entry of the Champlain customs-district. It thus is an important center of trade with Canada. Plattsburg is a garrison town, a summer resort and the seat of manufactures in iron, wood, wool, flour and sewing machines. Population 20,000.

Plautus (*plaw'tŭs*), **Titus Maccius,** the chief comedian of Rome, was born about 254 B. C. in Sarsina, a village in Umbria. We have no positive knowledge as to his early life and education, but it is probable that he came to Rome at an early age and there acquired his mastery of the most idiomatic Latin. At Rome he found employment in connection with the stage, and made money enough to set up in business for himself in the way of foreign trade. He, however, failed in business and returned to Rome in such poverty that he was compelled to earn his livelihood by turning a handmill, work usually performed by slaves. While engaged in this occupation, he wrote three plays, which proved so successful that from that time he was the favorite dramatist of his day. His plays were very popular, not only with the common people, but with the educated classes, and were acted in the time of Emperor Diocletian, five centuries later. The scenes of his comedies are always laid in Athens or in some other Greek town; but his Greek characters speak and act like Romans. Shakspere himself is not more careless about inconsistencies of this kind. The charm of Plautus lies in his genuine humor and grasp of character. He goes to the depths of human nature, and delights his readers to-day as truly as when he made the Roman theaters ring with applause or as when Jerome solaced himself in his cell by reading the well-loved comedies. Shakspere has imitated the plot of the *Menœchmi*, entirely recasting it in his *Comedy of Errors*. He died in 184 B. C. See *Roman Poets of the Republic* by Sellar.

Play′fair, Lyon, formerly known as Sir Lyon Playfair, an English chemist and statesman, was born in India, May 21, 1818, but educated at St. Andrews University, Scotland. He early became interested in chemistry, to which he devoted himself assiduously, going to Germany in 1838 to study under Baron Liebig. He served ten years as professor of chemistry in the University of Edinburgh, and in 1868 he was elected to Parliament to serve for the Universities of St. Andrews and Edinburgh, holding a seat for 17 years. He was postmaster-general, deputy speaker of the house and vice-president of the council at various periods. He was lord-in-waiting to the queen and counsel to the Prince of Wales. In 1883 he was made a K.C.B. In 1885 he was president of the Association for the Advancement of Science. He was raised to the peerage as Baron Playfair of St. Andrews in 1892. He was the author of works upon his chosen profession and edited an edition of *Liebig's Chemistry in Its Application to Agriculture and Physiology*. He died at London, May 29, 1898.

Play′grounds have originated in large cities, as London and New York, through the need of providing open spaces where the young may exercise freely yet under the necessary supervision. In London they developed from the movement in favor of parks for the people. London has 17,876 acres of parks; and, in addition, every public school has a playground attached. The movement in favor of open-air playgrounds for both men and boys was taken up in London by the Metropolitan Public Gardens Association; and afterwards by the London County Council. There are public gymnasia in all the parks, except the royal ones. In each playground there is a caretaker in uniform.

In New York playgrounds are established for systematic sports during two months of the school vacation. In 1902 110 playgrounds were thus organized, some in schoolgrounds, others on schoolhouse roofs, others again on piers or in parks. The afternoon sports in a summer playground are inaugurated perhaps by a grand march and one or two patriotic songs. Then the time is spent either in gymnastic drill or in free play. The little children play their kindergarten games. There are intervals for rest, during which music is played, a song sung or a story told. There are those who prefer to continue the manual occupations of the morning vacation school; and these give their attention to painting, weaving, modelling and the like. Some of the boys have little plots in which to raise vegetables. The swimming-pool is a valuable adjunct to the school's playground. The evening roof-gardens, with their fresh air and brass bands or, at least, pianos, supplement the function of the afternoon playgrounds. Small parks and playgrounds are provided also in Chicago and other large cities. See, also, VACATION SCHOOLS.

Plays. See DRAMA.

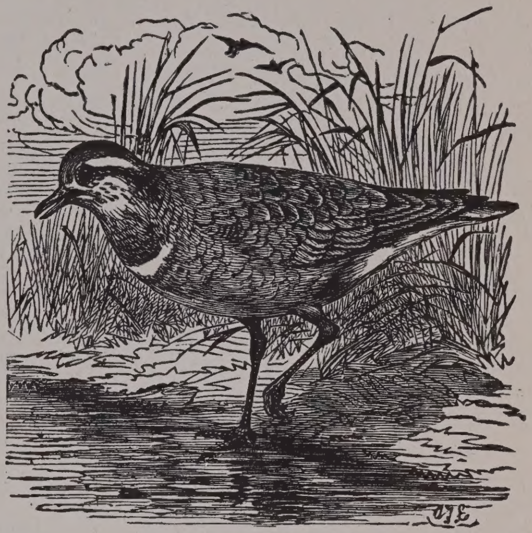
Pleiades (*plē′ya-dēz*), **The,** in Greek mythology, were, according to the most general account, the seven daughters of Atlas and Pleione. According to some accounts they committed suicide from grief, either at the death of their sisters, the Hyades, or at the fate of Atlas, their father; according to others they were companions of Diana, and, when pursued by Orion, were rescued from him by the gods translating them to the sky; all authorities, however, agree that after their death or translation they were transformed into stars. Their names are Electra, Maia, Taygeta, Alcyone, Calæno, Sterope and Merope. The group of the Pleiades, called the Seven Stars, is placed on the shoulders of Taurus, the second sign of the zodiac, and with the pole-star and the twins, Castor and Pollux, forms the three angular points of a triangle.

Ple′rome (in plants). At the growing tip of a stem or a root the great regions are organized in embryonic form. Both in stems and roots there are three such regions. On the outside is dermatogen (which see), which gives rise to the epidermis; within the dermatogen is the periblem (which see), which gives rise to the cortex; within the periblem and forming the central axis of the stem or root is the plerome, which gives rise in the mature stem or root to what is known as the stele, in which the woody bundles arise. A longitudinal section of an ordinary root or dicotyledonous stem will reveal these three great regions. Of course the pith which exists within the woody cylinder of the stem is a part of the stele.

Plin'y the Older (GAIUS PLINIUS SECUNDUS), so called to distinguish him from his nephew of the same name, was born either at Novum Comum (the modern Como) or at Verona in 23 A. D. His education was carried on at Rome under every advantage that wealth could furnish, and at 23 he entered the army, serving on the staff of L. Pomponius Secundus, then conducting a campaign in Germany. Returning to Rome in 52 he practiced at the bar for a short time, and then withdrew to Como, where, during the greater part of the reign of Nero, he devoted himself to reading and authorship. By incessant and lifelong application he amassed materials enough to fill the 160 volumes of manuscript which he bequeathed to his nephew. His *Historia Naturalis*, in 37 books, is the only one of his works that has come down to us. Under that title the ancients classified everything of natural origin, not only botany, zoology and mineralogy, but geography and astronomy. Pliny, however, extends this list by comments on human inventions and institutions, and even devotes two books to a history of fine art. Pliny was in command of the Roman fleet off Misenum when the great eruption of Vesuvius occurred in 79 A. D. Eager to witness the phenomenon as closely as possible, he landed at Stabiæ, but had not gone far toward the mountain when he was suffocated by the stifling vapors and cinders.

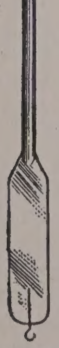
Pliny the Young'er (GAIUS PLINIUS CÆCILIUS SECUNDUS), was born at Novum Comum (Como), Italy, in 62 A. D. His education, after his tenth year when his father died, was conducted by his mother, Pliny the Elder, his uncle, and Virginius Rufus, his tutor. He early manifested the highest literary talents, and made such progress that in a few years he was known as one of the most accomplished men of his time. When only 18 he began to plead in the Forum; and at 25, the earliest possible age, he was emperor's quæstor, then prætor, and in 100 consul, when he wrote his panegyric on Emperor Trajan. He was twice married, but died without issue, in what year is not known. It is to his letters that Pliny owes his place in literature. An avowed imitator of Cicero, he caught much of the charm of his model, while his style is hardly, if at all, inferior. From Pliny we derive our impressions of the public and private life of the upper classes in the 1st century; and from his correspondence with Trajan we get our clearest knowledge of the feeling with which even one of the most enlightened Romans regarded the then obscure sect of Christians. Pliny consulted the emperor as to what could be done to stop the spread of what he called "a depraved and extravagant superstition," and in reply Trajan recommended that Christians should not be sought out on suspicion, but that, if accused and convicted of holding that faith, they should be punished. Accusations unsupported by proof were not to be received, while suspected persons were to have an opportunity of clearing themselves by offering prayers to the Roman gods. This official correspondence ended in 113, and Pliny then disappears from our view.

Plover (*plŭv'er*), a shore-bird with long wings and slender legs, related to the snipe; distinguished by small or medium size, plump bodies and short bills. Their food, chiefly animal, is picked up from the surface of the ground. They are swift in running and in flight, utter a mellow whistle, are gregarious save in the nesting season. Not shy, they are birds well-known to man. The lapwing of Europe is a plover. There are about 100 species, but only six are found in eastern North America. They live mostly near the water, but some forms visit uplands and dry fields. The killdeer is the one most generally known. It and the piping plover are the only ones that nest in the eastern United States. It is about 10½ inches long, with the upper parts brownish-gray and the tail rusty. The white breast is crossed by two dark bands which are the best field-marks. The ring-necked plover looks like a small killdeer. It is about 6¾ inches long, with a single black bar across the breast. It visits our shores on its way north in May, and, again, in August and September on its journey south. It is so small it is not shot as game. Besides the two mentioned, those less frequently seen in eastern North America are the golden, piping, black-breasted and Wilson plovers. Though furnishing but a morsel of food, more than one of the smaller plovers fall victims to the pot-hunter. The fine game-birds, the black-breasted and the golden plover, in


GOLDEN PLOVER

recent years have been practically exterminated in haunts where once abounding.

Plow, an instrument for breaking up and turning over the soil preparatory to the raising of a crop. The plow is mentioned in the Old Testament as having been used at a very early period; and Dr. E. B. Tylor, in his *Anthropology*, has clearly shown how it arose by gradual improvement from the hoe as that did from the pick or hatchet. The modern plow, with its moldboard for turning over the soil, was invented in the Netherlands a little more than two centuries since; but it has been greatly improved in that time. England took the lead in this improvement, followed by Scotland, in which country the chief inventors and improvers were Small (the inventor of the Scotch swing-plow), Wilkie, Gray and Sellar. In the American sulky-plow the weight of the implement is supported by wheels, thus decreasing friction and enabling the plowman to ride on the plow instead of walking. The double Michigan plow has a small plow on the beam in front of the other. The small plow pares off the surface of the soil and throws it into the previous furrow, and the large one completely buries it under a heavy furrowslice. Reversible or sidehill plows have the share and moldboard so they can be easily changed from one side to the other. Steam-plowing was first introduced in England in 1832. On the great farms of the American and Canadian prairies plows are set in gangs turning six or more furrows, and driven by traction steam-engines. Plowing can also, if the soil be soft, be done with gangs of rotary plows. These have cupped disks set at an angle and so weighted as to sink into the soil. With the use of these plows a few men accomplish great results. An engine is sometimes made to draw a line of plows, behind which is hitched a line of harrows, while behind these come a seed-drill and rakes.



PLUCKER TUBE

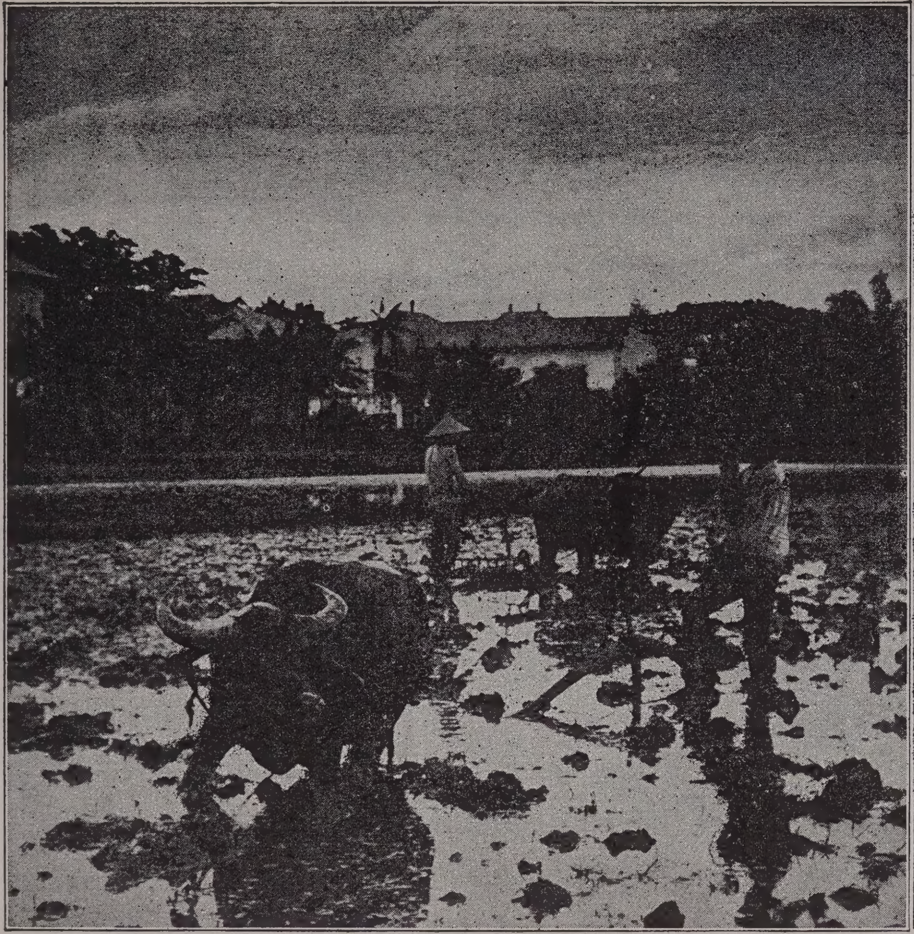
Pluck'er Tube, a long, slender, glass tube, first made by Geissler of Bonn (1858) on the suggestion of Plücker, for the examination of the spectra of gases. The original form of these tubes is shown in the accompanying figure. At each end a platinum wire is sealed in; and, when these wires are connected to the terminals of an induction coil, the electric discharge brings the gas to incandescence, so that its spectrum is then ready for examination by the spectroscope. An improved form of spectrum tube is one in which the capillary portion is placed "end on" instead of "side on" before the slit of the spectroscope. See Kayser's *Handbook of Spectroscopy* (in German).

Plum, certain species of the genus *Prunus* to which also belong the peaches and cherries. In the plum the flowers occur in umbel-like clusters and appear either before or with leaves. The fruit is a drupe or stone fruit, as in the case of peaches and cherries. The most common plum of cultivation is *P. domestica*, which probably is of Asiatic origin. Its fruits have been made to vary exceedingly as to shape and flavor. The common wild plum of the United States is *P. Americana*, with dull yellow fruit, splashed with spots of red, which is also under cultivation. The wild goose-plum is *P. hortulana*, with many varieties under cultivation. It is found wild in the Mississippi valley.

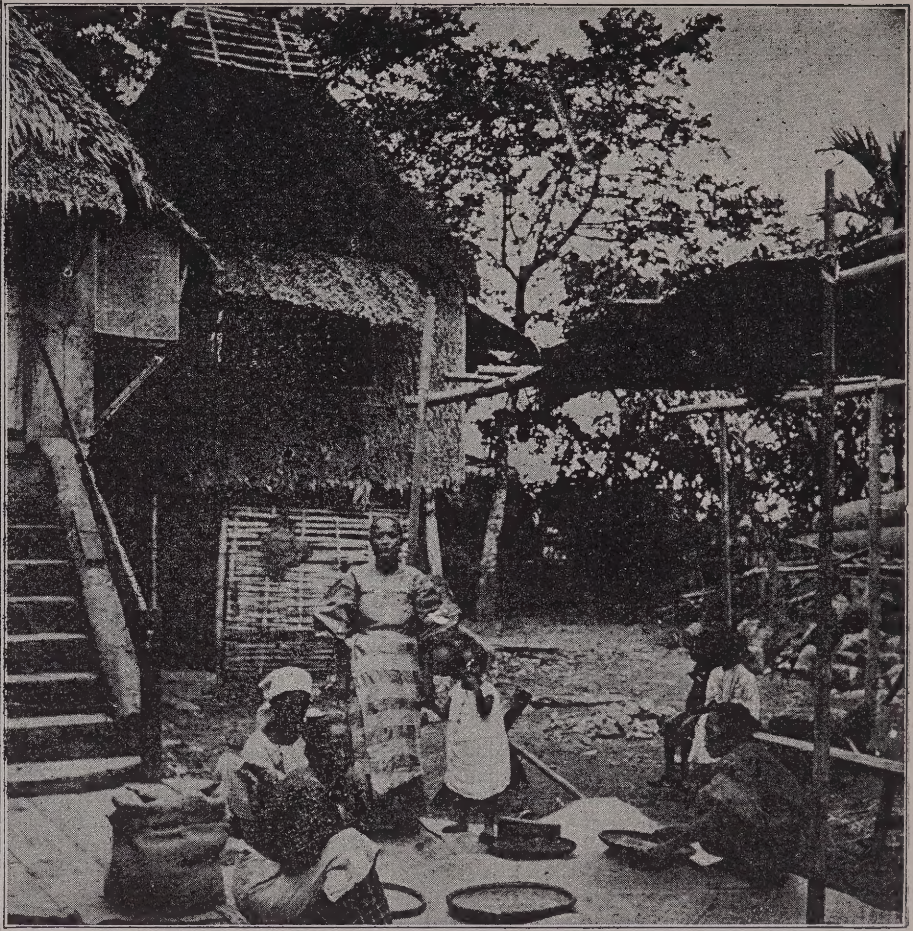
Plumb'ing, the art of casting and working in lead or other metals and applying them to various purposes connected with buildings, in its broadest sense including pipes and fixtures used to supply water, gas and heat and also the pipes used to remove liquid wastes. A more restricted and now common use of the term includes only water-supply and house-drainage systems, the providing of pipes and fixtures for gas and for heat being called gas-fitting and steam-fitting respectively. The word is derived from the Latin word meaning lead, this being the metal used in Rome and other ancient cities for purposes of water-supply pipes where the pressure was too great for pipes of earthenware. There has been a tremendous improvement in plumbing in recent years, and there is a rapidly growing appreciation of its importance to health as well as to comfort and convenience. Every city of to-day is provided with a system of water-works, and no house is complete if not provided with hot and cold water, with such fixtures as bath, basins, faucets, sinks and other appliances. In America, even in homes in rural districts, such provisions are now quite generally made, often at very heavy extra expense. It is known that some waters attack and decompose lead, giving rise to lead-poisoning, and in highly expensive plumbing copper is commonly employed for hot-water piping.

Plumule (*plū'mūl*) (in plants), the first terminal bud which appears in the embryos of most dicotyledons. Sometimes it is very minute, in other cases it contains a number of the early leaves of the plant, and in any case it develops the shoot. See EMBRYO.

Plu'tarch, a prolific author of the first century, was born at Chæronea in Bœotia, in 46 A. D. Scarcely anything is known of his personal history, except that he commenced to study at Athens under the academic philosopher Ammonius in 66, the year of Emperor Nero's progress through



PLOWING RICE LAND WITH WATER BUFFALO.



NATIVES IN PHILIPPINES WINNOWING RICE BY HAND.

Greece. He also spent several years at Rome, where he enjoyed the friendship of public officers and men of learning, besides devoting himself to a course of study and giving lectures on philosophy. Life at Rome not being altogether to his taste, he returned to Chæronea, where he became a magistrate, and died at 70 or 75 in the reign of Emperor Hadrian.

The work of Plutarch for which he is most noted is his *Parallel Lives*, in which he gives the life of some distinguished Greek and some distinguished Roman, and then draws a detailed comparison between them, although some authorities consider these comparisons spurious. These lives, 44 in number, as arranged in pairs, include Demosthenes and Cicero; Aristides and Cato the Elder; Pericles and Fabius Maximus; Alexander and Cæsar; Agesilaus and Pompey; Pyrrhus and Marius; and Alcibiades and Coriolanus among others. Plutarch was not a profound thinker, but he was a man of rare gifts, and adheres throughout to his professed purposes, which was portraiture of character. For this reason his *Lives* will remain the book of all ages, so that Plutarch may almost be called the interpreter of Greece and Rome to modern times. Emerson called him "the serenest and stablest figure in the world of letters." Shakspere was greatly indebted to Plutarch. See A. H. Clough's version of *Plutarch's Lives.*

Plu'to, the surname of Hades, in Grecian mythology is the third son of Cronos and Rhea and the brother of Zeus and Poseidon. To him belongs the sovereignty of the under world — the realm of darkness and ghostly shades — where he sits enthroned as a "subterranean Zeus," and rules the spirits of the dead. His dwelling place, however, is not far from the earth. Pluto is inexorable in disposition, not to be moved by prayers or flatteries, and is borne on a car drawn by four black steeds, whom he guides with golden reins. In Homer, Hades means a person, not a place; and the poet does not divide the realm of the shades into two distinct regions. All the souls of the dead — good and bad alike — mingle together. At a later day the kingdom of the dead was divided into Elysium, the abode of the good, and Tartarus, the abode of the wicked. This change also exercised an important influence on the ancients' conception of Pluto. The ruler of the underworld not only acquired additional power and majesty, but was regarded as a beneficent deity, who held the treasures of the earth (whence his name Pluto, from *plutein*, to be rich) in his hands, and caused the fruits and abundance of the earth to spring from under the ground. Hence in later times men prayed to him before digging for the wealth hid in the bowels of the earth.

Plym'outh Company, The, was incorporated in 1606 by a company of English merchants belonging to Plymouth and Bristol for the purpose of trade, especially with North Virginia; James I granted it a charter and a portion of territory lying between Passamaquoddy Bay and Long Island, so that it became a serious competitor with the London Company. In 1620 the Plymouth Company was reorganized. It had been the North Virginia Company; henceforth it was the New England Company. Under its auspices the Pilgrim Fathers (*q. v.*) obtained their patent for a settlement in so-called Virginia.

Plymouth, an English seaport on the northern shore of Plymouth Sound, 240 miles from London and 125 from Bristol. It was the favorite port of Edward the Black Prince, the chief rendezvous of Drake, Hawkins, Grenville, Raleigh and their fellows, and the final port of departure of the Pilgrim Fathers in the *Mayflower*. In the contest of Charles I with Parliament it sided with the latter, and after enduring a series of sieges and blockades, extending over four years, shared with Hull the honor of saving the parliamentary cause. In the reign of James II it was the first town to declare for the Prince of Orange (William III), and in the great French war it rivaled Portsmouth in naval activities. Population 112,042.

Plymouth, Mass., on Plymouth Bay, 37 miles by rail from Boston, is famous as the landing place of the Pilgrim Fathers, Dec. 21, 1620. Plymouth Rock, on which they landed, is a granite bowlder at the water's edge and is covered by a handsome granite canopy. The national monument, on a hill overlooking the landing-place, is 81 feet in height, and is surmounted by a central figure of Faith, with four immense stone figures, representing Morality, Education, Freedom and Law, around the base. In Pilgrim Hall are preserved many relics of the first settlement. The town is popular as a summer resort. It has a variety of manufactures—duck, cordage, woolen goods, tacks, wire nails and electrical supplies. Population, 14,000. See MAYFLOWER.

Plymouth, Pa., a borough on the Susquehanna, county-seat of Luzerne County, four miles from Wilkes-Barre, and in the center of the anthracite mining activities. It is served by the Delaware, Lackawanna and Western, the Delaware and Hartford and the Jersey Central which enters for coal-trade. It has public and high schools, churches, banks and other civic institutions. Its chief industry is the shipping and handling of coal, as it is in communication, both by water and rail, with Scranton and the mines of Wilkes-Barre. Among other occupations are hoisery, silk and mining-drill mills and a paper and wooden box factory. It is united by electric lines to other Wyoming-Valley towns, and claims the distinction of sending the first coal to market. Population 16,996.

Plymouth Sound, on the southwest of Devonshire, England, is a deep inlet of the English Channel into which the Tamar falls from the west and the River Plym from the east. In 1812 was begun the construction of Plymouth Breakwater, an insulated mole of stones, a mile in length, stretching across the middle of the sound and thoroughly protecting all vessels anchored within. It was not fully completed till 1841, and cost nearly $7,500,000. Plymouth Sound has been said to rival the Bay of Naples in beauty.

Pneumatics (*nŭ-măt'ĭks*), is that part of physics which treats of the properties of gases. It has to do with investigating their weight, pressure, elasticity, condensation etc. and with a large number of machines and appliances based upon the behavior of gases under pressure. Few studies in science have yielded more important results than has the study of the nature and properties of gases. Almost the entire structure of modern chemistry rests upon our knowledge of gases; and by the study of gases physicists have been led to a clear and simple explanation of the phenomena of heat and many other phenomena forming important chapters in modern physics. The applied sciences, too, owe much to our knowledge of gases. A knowledge of the properties of compressed air has led to many mechanical devices of the greatest economic value. A large variety of portable tools, percussion and rotary; the air-gun; the air-pump; and the diving-bell owe their origin to a knowledge of gases. Compressed air is used extensively in building bridge-piers, tunnels and other foundations, where water and quicksand are to be excluded. It has been used also for motor-power for street-railways, though not very economically. But for the transmission of mail and small parcels at high speed compressed air has been used to very great advantage, and its use in this direction is only beginning to be developed. The first application of pneumatic transmission to the conveying of mail and parcels was made in London in 1863, but the United States Government decided to give the system a trial only in 1892. The Western Union Telegraph Company has used it for many years, and it has been largely employed in commercial establishments for conveying change and goods. But it has not reached the development in this direction in the United States that it has in Europe. Its use in the United States for mechanical appliances, as carpenters', machinists' and other tools, is more developed.

Pneumatic Tires were first invented by R. W. Thompson, an English civil engineer, in 1843, for use on road-machines. In the United States a patent was granted in 1847. But it was not until these tires came to be used for bicycles that they acquired real importance. In 1889 Dr. J. B. Dunlop fitted his son's bicycle with a tire of rubber hose, with such success that a patent was obtained, although this patent covered certain details rather than the broad principle of the pneumatic tire. A patent of Mr. Tillinghast of Rhode Island led to the universal use of the pneumatic tire on bicycles within five or six years. The pneumatic tire is also employed universally on automobiles and widely for other vehicles. Its great advantage is that it sinks into small depressions instead of jumping over them, thus reducing both the jolt and the friction of motion and increasing speed. Its only defect is the liability to puncture, when the tire becomes useless until patched or renewed.

Pneumatic Tool, a mechanical tool operated by compressed air. In tunneling and mining pneumatic drills are used, and similar tools are used for stone-carving. The power is applied by pressure of compressed air against a piston in a cylinder, and by a suitable automatic valve the blow can be repeated several times a minute. Pneumatic riveting-machines and hoists are two other pneumatic tools used very extensively. Pneumatic tools are generally simple to operate, but not so economical as either steam or electricity.

Pneumonia, a germ disease causing inflammation of the lungs. The symptoms are chills, headache, followed by high fever and dry cough. Pain develops in the chest, breathing becomes difficult. Patient then spits a red-brown phlegm. Fever and inflammation take their rising course from five to ten days; if lungs become too congested, death results from strangulation. When fever breaks, the patient feels weak, but comfortable; at this time, guard against heart failure. Hot chest applications and plenty of fresh air relieve the patient. Skillful nursing is necessary. Physicians, knowing no absolute remedy, have depended upon the natural strength of the patient. Recently, Dr. L. B. Felton, Harvard Medical School, developed a non-violent horse serum, precipitating a white powder from the violent serum. This serum, injected, has been successfully used. Physicians expect a larger percentage of recoveries due to this serum.

Po, the largest river of Italy, rises on Monte Viso, one of the Cottian Alps, at an altitude of 6,000 feet, close to the French frontier. About 60 miles from its mouth, above Ferrara, it begins to form its delta, 60 miles wide from north to south. The delta is rapidly growing in area; Ravenna, once a city on the seashore, is now four miles inland. The entire length of the Po is 360 miles, and it drains an area of 28,900 square miles. It has always been a difficult river to cross on account of its width and the great volume of its waters; hence the commercial importance of such places as Piacenza and Turin, where there are the easiest fords.

Po'cahon'tas, daughter of the Indian chief Powhatan, was born about 1595. Her name has become famous for the part she is said to have played in saving the life of Captain John Smith in 1607. During one of Smith's exploring expeditions in Virginia he was taken prisoner by Powhatan, and his head laid on a log preparatory to having his brains beaten out by a club. At this juncture Pocahontas rushed between Smith and her father, and, placing her head on that of Smith, persuaded Powhatan to spare his life. Pocahontas married an Englishman named John Rolfe in 1614, and went to England with her husband two years later. After remaining in that country six or seven months, she embarked for Virginia, and died off Gravesend in March 1617.

Pod, the general name applied to dry and dehiscent fruits. A pod may be made up of one or more carpels. It is also used as the special name of a dry elongated fruit which consists of a single carpel, as in peas and beans. See FRUIT.

Poe (*pō*), **Edgar Allan,** an American poet, was born at Boston, Jan. 19, 1809. His father and mother both dying in his infancy, he was adopted by John Allan, a rich and childless merchant of Richmond. In 1826 he entered the University of Virginia at Charlottesville, but, although a brilliant and successful student, he quitted the institution at the end of a year, deeply involved in debt through his passion for gaming. After remaining at home a year or more he expressed a desire to enter the military profession, and Mr. Allan secured his appointment as a cadet at West Point. Here he drank to excess and so neglected his duties that he was court-martialed and dismissed in 1831. He returned to Richmond and was kindly received by his foster-father, who had become a widower and married a second time. It is related that Poe's conduct toward Mrs. Allan was such that he had to be driven from the house. Whether this were the case or not, when Mr. Allan died in 1834, Poe was not mentioned in his will. Thus thrown upon his own resources for a livelihood, Poe devoted himself to literature. In 1833 the publisher of a Baltimore magazine offered prizes of $100 each for the best poem and the best story, both of which were won by Poe. About the same time he secured employment in connection with *The Southern Literary Messenger* at Richmond, and while there married his cousin, Virginia Clem, a beautiful and saintly girl only 14 years old, who died in 1848. In 1837 Poe moved to New York City, where he spent the next few years in various kinds of literary labor, 1845 being marked by the appearance of his world-famous poem, *The Raven* (*q. v.*). In 1849 he visited Richmond. On the 4th of October he left Richmond for Baltimore, and a few hours after reaching the latter city he was found insensible on the street and taken to an hospital, where he died two or three days later (Oct. 7, 1849). In all the sad records of genius there is hardly any such dark and disastrous career as that of Poe. But whatever may be said of his morals, his genius must be conceded to be of a high order. Small in quantity and limited in range as is his poetry, there is that in it which gives it a high place in American literature and will cause it to be read and admired by many generations. See *Lives of Poe* by Ingram, Gill, Woodberry and S. H. Whitman, and Stedman's *Poets of America*.

Po'etry. Poetry stands between prose and music, partaking somewhat of the nature of each. In the representation of particular things or the expression of definite thoughts it is nearer to prose. In general emotional suggestion it is nearer to music. Its material may be whatever is selected by the poet from the life of nature and of man. But the poet's conscious selection is also unconsciously influenced by his race, nation, generation and circumstances; by his peculiar traits of observation, appreciation, understanding, emotion and imagination; and by his personal ideals, purpose and impulse. Thus, as a product, poetry combines the most individual with the most general characteristics.

The particular manner of expression which we associate with poetry is the result of a selection since the earliest times of whatever has proved most generally pleasing in form. Even though a poet be highly gifted with beauty of utterance, he is not likely to depart greatly from this accumulated judgment of the past with regard to structure and style. The peculiarities which characterize poetic expression lie chiefly in vocabulary, meter and structure or general arrangement. The vocabulary selected by poetry is usually more heightened or emotional than that of prose. It often is more concise, and, in addition, for the sake of picturesqueness and intensity, it consciously seeks variations from the ordinary choice and arrangement of words, by the use of tropes, as the simile and metaphor, and of figures, as repetition and contrast. In meter, poetry makes use of the rhythm attained by the arrangement of accents so that they recur regularly, from three to six accents being usually found in each verse or line. For convenience of study the usual groupings of accented syllables with the unaccented syllables which immediately accompany them are considered as poetic feet or measures. The commonest feet in modern English verse are the iambus, the trochee, the anapest and the dactyl. The most frequently used is the *iambus,* in which an unaccented syllable is followed by one which is accented. This is illustrated in the following six-accented or hexameter line: "When balmy showers refresh the mower's soil." The *trochee* is the reverse of the iambus, having an accented syllable followed by one which is unaccented, as in the following five-accented or pentameter line: "Spake full well in language quaint and olden." The *anapest* is like the iambus, but has two unaccented syllables preceding one which is accented, as in the following four-accented or tetrameter line: "There the warrior lay stretched in the midst of his pride." The *dactyl* is the reverse of the anapest, being like the trochee, but having two unaccented syllables followed by one which is accented. This is illustrated in the following three-accented or trimeter line: "Here we securely may hide us all." Stanzas are composed of groups of such lines, bound together by rime or a similarity in the sounds with which they end. Stanzas are not always used, and rime is not absolutely necessary, but rhythm is essential to poetry. Blank verse or unrhymed iambic pentameter, is the favorite verse of Shakspere and Milton. The melody is often increased by the careful use of pauses; by alliteration or the repetition of the sounds with which words begin; by assonance or the repetition of the same arrangement of vowels in two or more words; and by onomatopœia or a close suiting of the sound to the sense.

The most characteristic forms of poetic structure are the lyric, the epic and the drama.

Lyric Poetry, which is much the more common, had its origin in singing, and still possesses many qualities which associate it with music. It usually deals in a personal and individual way with interests which are definite and present and usually of a subjective and emotional nature. It is best when spontaneous, sincere and brief. Its many varieties have grown from variations in form suited to its wide range of subjects. It may deal with religion, as in Whittier's *The Eternal Goodness*; with patriotism, as in Lowell's *Commemoration Ode;* with affection, as in Poe's *Annabel Lee;* with nature, as in Bryant's *Thanatopsis;* with grief, as in Emerson's *Threnody;* with reflection, as in Longfellow's *My Lost Youth;* with social life, as in Holmes's *The Boys.* There also are numerous fixed forms of the lyric, the chief of these being the sonnet, with fourteen lines always and a specified arrangement of rimes.

The *epic*, which probably was the earliest form of poetry, had its origin in recitation. As contrasted with the lyric, it is impersonal in attitude and general in interest, dealing usually with objective events of a national or racial character, especially as they are represented in the experiences of a typical hero. In form it is long, simple and regular. The Greek *Iliad* and *Odyssey*, the Anglo-Saxon *Beowulf*, the medieval romances of King Arthur and a few modern poems like Longfellow's *Hiawatha* are examples. Related forms are the allegory, like Dante's *Divine Comedy;* the idyl, like Whittier's *Snow-Bound;* and the ballad, as in the Robin Hood cycle.

The *drama*, having its origin in acting, unites many of the characteristics of the epic and of the lyric. It presents the past as present, gives outward form to inward spirit, and embodies general characteristics of human nature in its characters and fundamental laws of cause and effect in its plots. Both the ancient and the modern drama began as religious ceremonies, but by the time of Shakspere the drama had become wholly secular. In general, each play either is a tragedy, in which the hero is overcome through his fault or error or fate; or is a comedy, in which the hero triumphs. There is a great distinction between the poetic drama and that which is merely intended for the stage, but even the latter suggests the introduction, complication, climax, solution and conclusion which are the characteristic divisions of almost every work of literature.

It will be evident, in conclusion, that poetry, in addition to delighting the reader with a "beauty [which] is its own excuse for being," may be a means of cultivating fine emotion, informing the mind, developing the intellect, and training and stimulating the will.

To select the best out of the great mass that has been and is being written is not difficult after one has experienced the pleasure and profit to be derived from familiarity with even one example of such poetry as the world has long judged great. The thorough enjoyment of a drama by Shakspere, a lyric by Wordsworth or one of Tennyson's *Idyls of the King* is an experience which enables the student to recognize excellence in any poetry he may meet, and will make the reading of any but the excellent a disappointment. In the study of any poem one may well attend to the nature, source and handling of the material; to the mood of the poet and its development; the essential theme, its treatment and conclusion; the diction, meter, form; and any other notable characteristics. It always is interesting and valuable to become familiar with enough examples of the work of a single author to acquire an impression of the general character of his product, his personal attitude toward life and his individual suggestion for the solution of its problems.

Pog'gendorff, Johann Christian, an eminent German physicist, was born at Hamburg, Dec. 29, 1796; and died at Berlin, Jan. 2, 1877. He is best known, perhaps, in his capacity as editor of the great German periodical *Annals of Physics and Chemistry.*

Poincaré (*pwăn-kȧ-rā'*), **Raymond,** a noted French statesman and writer, was born in the little town of Bar-le-Duc, in Lorraine, on August 2, 1860. His father was an engineer and his mother a descendant of a politically distinguished family. The sons of M. and Mme. Poincaré achieved signal honors in their particular fields of interest, Lucien in electricity and physics, Jules in higher mathematics, and Raymond in the affairs of State. Raymond was but a lad ten years of age when Prussia seized the provinces of Alsace and Lorraine, an event which left a deep and lasting impression on the boy who in later life determined to restore the old frontiers of France. He was educated at the College of Nancy. In 1880 young Poincaré was called to the bar and practised law in Paris. He was soon attracted toward the political turnings of the day, however, and became a political writer on the *Voltaire,* and at a later date on the *Republique Française.* His first participation in the active political life of his country came in 1887. In that year, when he was but twenty-seven years of age, M. Poincaré was elected to the Chamber of Deputies as a moderate Republican for the Department of the Meuse. Six years later he became Minister of Public Instruction in the Cabinet. In 1894 he accepted the portfolio of Minister of Finance, and it was in this capacity that the young statesman won renown. From 1895-98 M. Poincaré served as Vice-President of the Chamber. He entered the Senate in 1903.

In 1906, Raymond Poincaré married Mlle. Henriette Benucci, an actress of Italian parentage, well known for her talent and beauty. She later won the distinction of having been the first wife of a President of France ever to be received officially at foreign courts.

It was in this same year that M. Poincaré held office in the Ministry of Finance for but a short time only. The government met default and Georges Clemenceau, a most bitter opponent of M. Poincaré, became Premier. It was not until 1912 that the French statesman again held public office. In that year he became Premier of France and Minister of Foreign Affairs. In the following year he was elected ninth President of the Republic, just one year before France entered the World War. M. Poincaré was a "wartime President of France," although these years were not the most notable years in his public career. M. Clemenceau was again Premier of France and played the most conspicuous rôle of all French statesmen during the war. M. Poincaré retired from public life in 1920. In 1922, however, President Millerand requested the noted statesman to form a cabinet. Then followed the brilliant years Poincaré's political life. In his capacity as Premier, M. Poincaré ordered French troops to occupy the Ruhr Basin in 1923, in an effort to force Germany to resume its reparations payments and to further give "substantial guarantees of continuing to pay." The brilliant French statesman again retired from an active political life upon the resignation of President Millerand.

Four years later, when the French fiscal system seemed near collapse, President Doumergue called upon Raymond Poincaré to assume the charge of financial affairs. Through his efficient leadership the franc was saved. Within six months the foreign exchange value of the franc had been doubled and the floating indebtedness of the Republic consolidated. The veteran statesman next turned his attention to the problem of war debts. He had ever nourished the idea that both the United States and Great Britain should have cancelled the obligations of France. He also strove desperately to link German reparations to the war debts. Although he failed to see these hopes realized, he did succeed in seeing the Young Plan put into operation.

Among the best known writings of this distinguished statesman are: *Messages, Discours, Allocutions, Lettres et Télégrammes* (1919-21) of which there are three volumes; *Histoire Politique,* four volumes, (1920-22); *La Victoire et la Paix* (1921); *Les Origines de la Guerre* (1921); *The Memoires of Raymond Poincaré* (1926-29), and *Parole Française* (1927).

The aged statesman was forced to resign from public life because of ill health in 1929. In December of the following year he declined to accept the premiership of the Republic. He was elected leader of the French bar in June, 1931. In his retirement he devoted much of his time to the care of his feathered pets and bees which he enthusiastically kept. On October 15, 1934, the venerable statesman died at his home in Paris, at the age of seventy-four years. His remains were removed to the Pantheon, the resting place of the most distinguished citizens of the Third Republic, on October 18. Religious rites were conducted at Notre Dame on October 20, and the body of the statesman who stood at the head of the French state during the World War was conveyed to Nubecourt near Bar-le-Duc, Lorraine, where Poincaré was born. He was buried in the little family cemetery there.

Poindexter, George, a noted American statesman, was born in Louisa County, Virginia, in 1779. He entered upon a law career at an early age in Milton, Virginia. In 1802 he moved to the Mississippi Territory of which he became Attorney-General in the following year. He became a member of the Territorial Legislature in 1806. In 1807 Poindexter conducted the prosecution of Aaron Burr. The following four years he was a delegate to the House of Representatives. In 1813 came his appointment as Judge of the Mississippi Territory. He became chairman of the committee which sat to prepare a constitution for the State and later became the first Representative of that State in the National Congress. Poindexter became especially famous for his splendid defense of General Jackson's course in Florida. He was elected Governor of Mississippi in 1819. While serving his State in that capacity, Poindexter prepared *The Revised Code of Law of Mississippi* in 1824. It was during the years that he served as Senator from Mississippi that Poindexter quarrelled with General Jackson. As a result of this breach, the Senator moved first to Louisville, Kentucky, and at a later date to Mississippi. Earlier in his life, in 1811, George Poindexter had been accused of killing Abijah Hunt in a duel which resulted from one of his numerous quarrels. Poindexter was accused of having fired at his foe before the word "fire" was uttered. The charges against the statesman were, however, never proved. He died in 1853.

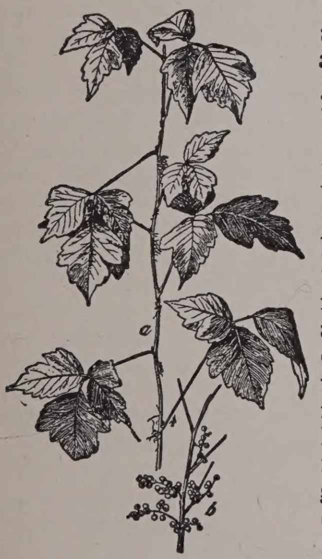
Poinding (*pünd'ĭng*), that process by which, in the law of Scotland, a creditor may seize his debtor's property so as to become vested with the title and the right of sale or appropriation in satisfaction of his debt.

Pointer. See Dog.

Poison Ivy. See Poisonous Plants.

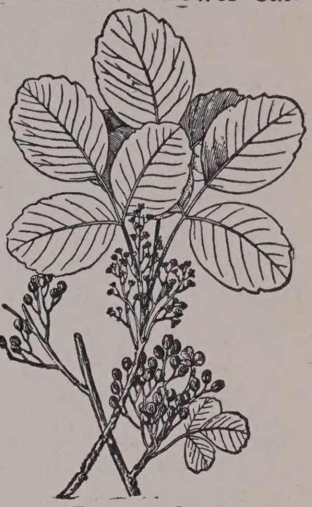
Poisonous Plants. Of the number found in the United States mention may be made of poison ivy, poison sumac, poison hemlock, water hemlock, pokeweed, corn cockle, black cherry, red buckeye, horse chestnut, laurel and jimson weed.

Poison Ivy, a climbing or trailing shrub (sometimes erect), with variable three-foliate leaves, aërial rootlets and greenish flowers, appearing in May and June. The smooth, waxy fruit often remains on the plant until late in winter. The leaves often resemble those of the box-elder, as in the figure; but their margin is frequently almost entire. They differ from those of the Virginia creeper in having only three leaflets instead of five. Poison ivy grows everywhere in open brush, in ravines and on the borders of woods, and it is spread along roadsides and cultivated fields from seeds carried by crows, woodpeckers and other birds that feed upon its fruit in winter. The plant occurs abundantly throughout the United States as far as eastern Texas, eastern Kansas and Minnesota and in greater or less abundance throughout the less arid region of the west, with the exception of California, where it appears to be entirely replaced by *Rhus diversiloba.*



Poison Ivy

Poison Oak plant differs from poison ivy mainly in the character of its leaflets, which are somewhat thicker and smaller, more nearly elliptical and less sharply lobed. Their similarity to the leaves of the western oaks gives the plant its common name. The poison oak thrives best on cool, westward mountain slopes and in ravines, but is quite generally spread throughout the Pacific coast from Lower California and Arizona to British America. It does not, however, frequent the higher mountains.



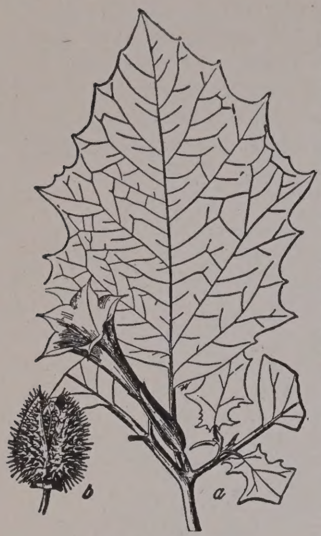
Poison Oak

Poison Sumac is an absorbent shrub six to thirty feet high, with long, pinnate leaves, having from seven to thirteen entire leaflets. The wood has a faint, sulphurous odor, which together with the leaf scars, which are very prominent, enables one to distinguish the plant from other shrubbery in winter. It grows in swamps and in damp woods from Florida to Canada and westward to Louisiana. Poison ivy, poison oak and poison-sumac each produce about the same effect on the human skin.

Pokeweed shoots are often eaten for greens in the spring, but great care must be taken in so using the plant, as the root is very poisonous. The berries are greatly enjoyed by birds, though sometimes cases of poison have been traced to the fruit. It is a fine, sturdy plant, grows from five to ten feet high, the large smooth leaves are on long petioles, white and pink blossoms may be seen from July to September, the fruit is a generous bunch of juicy purple berries. The range of the plant is general; it grows on the outside border of fields.

Corn Cockle grows in grain fields, bears blossoms of purple-red, adds no little to the beauty of a field but is a grievous pest. Its black seeds mix with the seeds of the grain; occasionally a low-grade flour will show some of the black of the corn cockle's seed-coats and cases of poison have resulted from the presence of corn cockle in flour. Such flour has a peculiar odor when moistened. Corn cockle stem is stout and many-branching; its leaves are pale green and hairy, the flower is terminal and solitary and may be seen from July to September.

Black Cherry seeds and leaves (see Cherry) may contain enough prussic acid to cause poisoning; kernels should not be eaten; fresh-cut branches should not be put where cattle can get at them. Seeds, fresh leaves and twigs of red buckeye and common horse-chestnut contain poison. The leaves of evergreen laurels have been fatal to animals. Jimson weed (Jamestown weed and thorn-apple) getting into the hay of cattle proves disastrous, and poisoning has resulted from children handling flowers and eating seeds. It is a weed of bushy habit; it grows rank in waste places; the stem is from two to five feet high; the leaves are large and flaccid, the showy flowers, white or purple in color, in shape resemble the morning glory, but have a heavy, unpleasant odor. The purple variety is especially poisonous. The weeds belong to the nightshade family. It grows along roadsides, in pastures and in gardens. See Chestnut's *Thirty Poisonous Plants of the United States*, Farmers' Bulletin 86, U. S. Department of Agriculture.



JIMSON WEED

Poisons. A poison may be defined as "any substance or matter which, when introduced into the body in any way, can destroy life by its own inherent qualities without acting mechanically." Poisons are sometimes classified according to their source as mineral, vegetable and animal; or, more generally, according to their action as *irritants*, *narcotics* and *narcotic irritants*. The irritants, when taken in ordinary doses, produce intense vomiting and purging and severe abdominal pain. They act directly upon the stomach and intestines, which they inflame and frequently corrode. The narcotics act specially on the brain and spinal cord. Among their most common symptoms are headache, giddiness, obscurity of sight, stupor, loss of muscular power, convulsions and finally complete coma. They have no acrid, burning taste, and, except a slight fullness of the cerebral vessels, they leave no clearly marked post-mortem appearance. The narcotico-irritants have a mixed action. At varying periods after they have been swallowed they produce stupor, coma, paralysis and convulsions, owing to their effect on the brain and spinal marrow. As examples of irritant poisons we may mention sulphuric, nitric and oxalic acids (in doses of half an ounce or more), carbolic acid, arsenic, corrosive sublimate, blue vitriol, lunar caustic and chloride of antimony. Among the narcotics are opium, belladonna, alcohol, ether, India hemp, chloral and chloroform. The narcotico-irritants include prussic acid, strychnine, *nux vomica*, hemlock, aconite and nicotine (the active principle of tobacco). The evils resulting from the use of alcohol in its various forms have caused laws restricting or prohibiting the sale of intoxicating liquors to be passed in most of the states of the Union; and, as a preventive of the evils resulting both from alcohol and tobacco nearly all the states have laws providing for instruction in the public schools as to the effect of narcotics upon the brain and nervous system.

Poisson (*pwä'sôn'*), **Simeon Denis,** an eminent French mathematical physicist, was born at Pithiviers, June 21, 1781, and died at Paris, April 25, 1840. He was educated at the *École Centrale* at Fontainebleau and at the *École Polytechnique* at Paris. Only four years after entering the latter he became its professor of mechanics and analysis. In 1812 he was elected to the Academy. Among his most important works must be mentioned, in pure mathematics, his contributions to the calculus of variations and to the theory of probabilities; in astronomy, his proof of the stability of the solar system; in physics, his very important theorems in electrostatics and in fluid motion, his theory of capillarity and his mathematical theory of heat. His *Mechanics* was a standard textbook for half a century. See Arago's *Notices Biographiques*, Vol. 2.

Poitiers (*pwä'tyā'*), a city of France, occupying the summit and slopes of a hill at whose base flow Clain and Boivre Rivers. Before the French Revolution it had a large number of religious edifices, which even yet are quite numerous. Within and about the city are numerous Roman and Celtic remains, and here, in 1882, the remains of an entire Gallo-Roman town were discovered, with temple, baths and streets spread over 14 acres. In the vicinity of Poitiers Alaric II, the Visigoth was defeated and slain by Clovis in 507, and between Poitiers and Tours Charles Martel won his great victory in 732 over the Saracens under Abd-ur-Rahman. On Sept. 19, 1356, about five miles north of the city, Edward the Black Prince, with only 12,000 or 14,000 English and Gascon troops, defeated about 60,000 of the troops of King John of France, killing 11,000 and taking more than 2,000 prisoners. Population 39,302.

Po'land now a self-governing nation, reconstructed after the World-War (*q. v.*) of territory which was formerly divided up between Austria, Russia and Prussia, was, before its partition by these three powers bounded on the north by the Baltic Sea and the Russian provinces of Riga and Pskof; on the east by the Russian provinces of Smolensk, Tchernigoff, Poltava and Kherson; on the south by Bessarabia, Moldavia and the Carpathian Mountains; and on the west by the Prussian provinces of Silesia, Brandenburg and Pomerania. Its dimensions from north to south and from east to west were about seven hundred miles, embracing an area of about

149,960 square miles. This extensive tract is crossed only by one range of hills, which rises from the north of the Carpathian Mountains and runs northeastward, forming the watershed between the rivers which flow into the Baltic and Black Seas. Much of the soil is rich pasture-land, or covered with forests of pine, birch and oak. There is no real Polish history until the reign of Mieczyslaw, 962-92. He became a convert to Christianity, and Poland took her place as one of the political powers, which she continued to hold till the close of the eighteenth century, when her independence was destroyed and her territory divided between Austria, Russia and Prussia. The first partition of Poland took place in 1772, when Russia seized 42,000 square miles of her territory, Prussia 13,000 and Austria 27,000. In 1793, after a fruitless resistance to the united forces of Russia and Prussia, Poland suffered another loss of territory, Russia taking possession of 96,000 square miles and Prussia of 22,000. The Poles became desperate, and there was a general uprising of the people against the invaders. The Prussians were compelled to retreat to their own country, and the Russians were several times routed. Austria engaged in the contest, however, and fresh Russian troops also arrived. Kosciusko being defeated and taken prisoner at the battle of Maciejowice, the Russians entered Warsaw in 1813 and the Polish kingdom came to an end. In the third and last partition of Poland the remainder of the country was divided as follows: Russia, 49,018 square miles (all of Poland she now owns); Prussia, 21,000, and Austria, 18,000. King Stanislaus resigned his crown, and died at St. Petersburg in 1798. The main causes of the downfall of Poland, in addition to the greed and selfishness of the European powers, were the lack of union and patriotism, the lack of a Polish middle class, weakness of the kings, and the lack of natural frontiers. Until 1918 Poland formed a department of Russia, embracing ten provinces with a population of about 12,000,000. In 1868 it was incorporated as an integral part of Russia.

An ideal of autonomy seemed to dominate Polish sentiment in the nineteenth century. On November 5, 1916, the Central Powers of Europe proclaimed Poland an independent State with a dynastic monarchy and a constitutional Government. The territory embraced in this new State comprised only that of the former Russian provinces occupied by the Russian and Austrian armies. The following year a Regency Council was formed under the Presidency of John Kucharzewski, a leader of the Polish Socialist Party. The Regency Council resigned and Joseph Pilsudski came into authority in 1918.

Upper Silesia was adjudicated by the League of Nations in 1920. There was transferred from Germany, against the plebiscite vote, 800,000 acres of land to Poland, including large areas of zinc, coal, lead and iron. Danzig was made a free port for Poland. This has made Germany all the more antagonistic. French funds have been loaned Poland for military and rehabilitation purposes.

On January 26, 1934, the Polish Sejm approved the new constitution for the Republic which had been submitted to its Constitutional Committee for consideration in the latter part of December, 1933. Three years have been spent in drafting the new instrument of government for Poland which discards "parliamentary democracy" in favor of "strong executive government." The new constitution calls for the continuance of a Parliament composed of two chambers, the Sejm or lower house, and the Senate or upper house. Forty members of the Senate will henceforth be appointed by the President and eighty members will be chosen by a war veterans' electorate which is to be composed of only those veterans who hold the *Virtute Militari* and the Independence Cross, military decorations awarded those who participated in Poland's war for independence. The Sejm will continue to be chosen by popular vote until 1939. Both houses will enjoy equal rights, but both parliamentary chambers will be subordinated to the powerful Chief Executive whom the Constitution aims at creating.

Poland's War Minister, Marshal Pilsudski, has heretofore exercised dictatorial power through the President of the Republic. In the future this power will lie with the President, a power which Poland deemed it necessary to establish before Marshal Pilsudski becomes incapacitated by age and health and incapable of wielding that power.

Heretofore the President of Poland has been chosen by the National Assembly which is composed of members of the Senate and Sejm. Under the new order of government the incumbent of the office will nominate a candidate for the Presidency. An "Assembly of Electors," to be composed of the Speakers of both Chambers, the president of the Supreme Court, the commander-in-chief of the army, and seventy-five others chosen by Parliament from the membership of both houses, will also nominate a candidate. In the event that both authorities nominate the same candidate, that person will automatically become President of Poland to serve a seven-year term. Should, however, the candidates be two separate individuals, the people will choose their Executive by voting for the two candidates.

The new Executive will have the status of a "constitutional dictator." He will appoint the Premier and the Cabinet the members of which will be responsible to their Executive alone; he may dissolve Parliament and veto any of its legislation. Although both Chambers of Parliament may demand the dismissal of a Minister that demand cannot be enforced without the sanction of the Chief Executive who will represent the real governing power in the Polish Republic. According to Marshal Pilsudski, "parliamentary democracy is an obsolete form of government."

The Opposition in the Sejm attempted to prevent that Chamber's adoption of the Constitution by maintaining that a two-thirds majority of the Sejm and the Senate would be necessary before the bill could be passed, and that only after the measure had been submitted to three readings. A formal bill was drafted by the committee upon the ruling of Deputy Speaker Car. With only government supporters present in the Chamber the measure was quickly approved and rushed through three readings in a single session.

On this same date non-aggression pact between Poland and Germany was signed in Berlin. It was ratified in Warsaw on February 24. The ten-year amity agreement was followed a few days later by a "propaganda alliance" which was announced in Berlin. "To promote the effect of the recent Polish-German agreement, the representatives of both parties have agreed to co-operate on all questions in forming public opinion in their respective countries to the end that mutual understanding may be increasingly awakened and that a friendly atmosphere may thereby be assured. Complete unanimity was reached respecting steps to be taken in the fields of the press, authorship, radio, moving pictures and the theatre."

In February 1, 1934, a non-aggression pact between Poland and Soviet Russia, which was concluded in January, 1932, was extended to ten years. The agreement had originally been signed for a three-year period. The extension of the pact followed close upon Foreign Minister Beck's visit to Moscow on February 13-17. It was quite apparent that the purpose of the visit was to assuage Russian sentiment which was decidedly opposed to the Polish German pact.

The non-aggression pact of January 26 with Germany was followed in March 1, 1934, by a trade pact between the two powers which brought to a close the tariff hostilities which have existed for more than eight years. In the nine-year period, from 1924-33, German-Polish trade has been decidedly decreased. In 1924 that trade amounted to $300,000,000. In 1933, however, it had dwindled to $43,000,000. It is generally believed that the conclusion of this new trade pact between the two nations will act as a powerful stimulus to German-Polish trade. The pact is not a commercial treaty but rather a protocol which removes the restrictions and prohibitions which have been mounting between both countries as a result of the tariff war which was begun in 1925.

In March, the budget session of Parliament was adjourned by Presidential decree. During this session the Senate had failed to act on the new constitution. It has been rumored that Marshal Pilsudski wishes to modify the organ somewhat before it became law. A special session of Parliament will be called during the summer months to act upon the new instrument of government. President Moscicki was granted the power to issue interim decrees just before Parliament was prorogued. These decrees will have the force of law. Poland will soon be occupied with the election of a new President. The most likely candidate to date is Foreign Minister Beck.

Polar Bear. See Bear.

Polar Circle. See Arctic Circle.

Polar Exploration. The original motive of the English in exploring the arctic seacoast was to discover a route to the wealthy countries of eastern Asia and to share in the traffic formerly monopolized by Spain and Portugal. Thus arose attempts both to sail eastward along the north of Europe and Asia and westward across the Atlantic. Hence arose the terms, northeast passage and northwest passage. Some have traced the history of arctic exploration to the time of King Alfred, but Cabot's discovery of Labrador and Newfoundland in 1497 may be deemed the first step in the exploration of American polar regions. Frobisher first sailed in 1576, and in 1585-8 the great navigator Davis sailed up the strait bearing his name and coasted the west of Greenland, the "land of desolation." Hudson, who had formerly tried the northeast passage in 1610, discovered the great bay and strait that bear his name. From the size of the bay he thought it was a part of the Pacific Ocean, but this was disproved by Button, the next English explorer, two years later. After the expedition of Fox and James in 1631, which led only to the partial exploration of what was then named Fox Channel, the North American coast was neglected for more than a century. In the reign of George III there was a revival of English zeal in naval adventure and discovery. Captain Phipps (afterwards Lord Mulgrave) sailed in 1773 to Spitzbergen, where the heavy pack-ice kept him for nearly a month from proceeding further north. He finally reached 80° N., but Cook, who made the next attempt could only penetrate to 70° 45′. After these failures there was no further effort until 1806, when Scoresby explored Jan Mayen Island and the eastern coast of Greenland. The famous expedition of Sir John Franklin left England, May 18, 1845, his object being to reach Bering Strait from Lancaster Sound. In 70° N. and 98° W. the ships were beset. Among expeditions in search of Franklin was that of Collinson and McClure, which sailed to Bering Strait in 1850. Fixed in the ice on its voyage eastward, McClure's ship was rescued next spring about sixty miles west of Barrow Strait. Belcher now turned toward the Atlantic, and thus McClure reached England in 1854, after traversing the northwest passage from ocean to ocean. He therefore received the honor of knighthood, and $50,000 was voted by Parliament to him and his crew. Several routes are now completely mapped between Davis Strait and Bering Strait.

More recent explorations north of America added little to geographical knowledge, however interesting their scientific aspects. The expedition of Kane and Hayes in 1853-5 reached Cape Constitution in 82° N., and saw what appeared to be an open polar sea. In 1871 Captain C. F. Hall sailed from New London, United States, and reached 82° 16′ N., which was surpassed in 1876 by the English expedition under Captain Nares. More famous and more disastrous was the Lady Franklin Bay expedition of 1881 under A. W. Greely (*q. v.*). In October, 1883, Greely landed at Cape Sabine, one of the bleakest spots in the arctic regions, and there, in June, 1884, Commander Schley found the six men who still survived. In 1869-70 Captain Coldewey's expedition reached 77° on the east of Greenland. The *Jeanette* expedition under Commander De Long (*q. v.*), sent by the New York *Herald* in 1879 to push north by Bering Strait, ended in disaster, the vessel being ice-crushed in June, 1882.

In the summer of 1886, Robert E. Peary (*q. v.*) advanced one hundred miles on the ice-cap of northern Greenland due east from the head of Disco Bay, reaching an altitude of 7500 ft. In 1888 Nansen crossed the ice-cap in southern Greenland from east to west, attaining an altitude of 9000 ft. Peary set out again June 6, 1891, reached McCormick Bay July 24, and established his winter quarters there, his ship commanded by Heilprin returning home. Starting northward May 14, 1892, across the inland ice-cap of Greenland he reached the unknown northern part of the east coast of Greenland July 4, at Navy Cliff, Independence Bay. In 1892 Heilprin came north again for the expedition and it returned home, having determined the northern limits of the Greenland ice-cap. In the same year Jackson, under the patronage of Sir Alfred Harmsworth, explored Franz Josef Land. In 1895 Peary again crossed the ice-cap to Independence Bay but was compelled by lack of food to return without having accomplished much beyond his previous trip.

A noteworthy attempt was made by Nansen, who, having constructed a ship after his own designs, permitted it to be frozen into the ice-pack of Kara Sea in 1893, and with the ice his ship was drifted across the frozen seas. He had hoped to come out of the ice between Iceland and Spitzbergen; but, the ice-pack not floating so far north as he had supposed, he left the ship and sought to go further on foot. At last he was obliged to turn back; and he reached Franz Josef Land in 1895 and returned to Norway in 1896. His furthest north was 86° 15′.

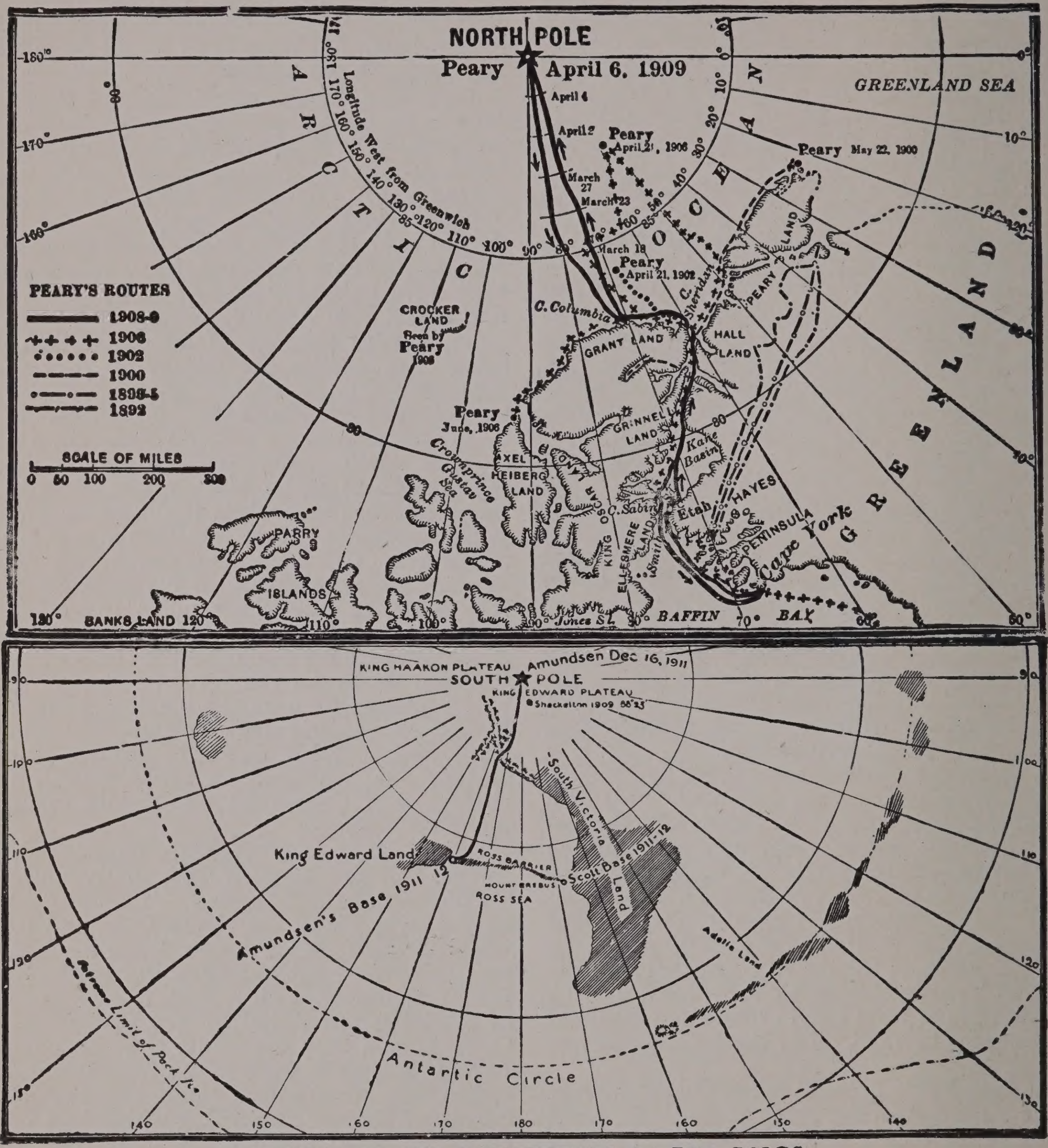
In 1897 Peary brought home the three great Cape York meteorites which he had discovered in 1894. In 1898-1902 Peary went north again and was gone over four years and three months. In this expedition he rounded the northern end of Greenland, and proved conclusively its insularity. He reached 83° 17′ N. Lat., on the sea ice north of Grant Land. The Duke of Abruzzi, who sailed in 1899, reached a point 19 geographical miles nearer the goal sought than had been reached by Nansen, Cagni, his captain reaching 86° 33′. In 1898-1901 Sverdrup made extensive explorations in Ellesmere Land. In 1905 Peary made another attempt in his ship the Roosevelt, built for him by the Peary Arctic Club. With the ship he reached 82° 27′ N. Leaving his ship in Feb., 1906, he pushed forward with dog-sledges and reached 87° 6′ N., the furthest north. In 1903-06 Amundsen (*q. v.*) determined the northern magnetic pole and traversed the northwest passage from the Atlantic to the Pacific. In 1906-08 Leffingwell, Mikkelsen and Skarkersen explored unknown Beaufort Sea, north of Alaska and west of Parry Archipelago. Wellman tried to sail by airship from Spitzbergen to the pole.

In 1909 came the announcement that the long sought goal—the North Pole—had been reached. Dr. Frederick A. Cook (*q. v.*) who went on a cruise in arctic waters in the summer of 1907. announced from Copenhagen Sept. 2, 1909, that he had found the Pole April 21, 1908. Five days later Commander Robert E. Peary reported by wireless message from Labrador that he had planted the flag at the Pole April 6, 1909.

Dr. Cook's account of his expedition related that during the winter of 1907-8 at Annootok on the west coast of Greenland, he gathered an equipment of sledges, men, dogs and provisions and on Feb. 19, 1908, started north. Advancing into the polar sea, on March 18 he sent back a part of his men and dogs and when the crossing of the polar pack was begun the train was further reduced to two men and twenty-six dogs. With these he started on his final dash of four hundred and sixty miles to his goal, which he reached on April 21, 1908. Remaining there for two days for taking observations, he began the return journey April 23. Delayed by unfavorable conditions and baffled by westerly drift, he struggled southward, was carried down to Crown Prince Gustav Sea, wintered on Jones Sound, and the shore of Greenland was finally reached April 15, 1909.

Cook's claim was promptly challenged by Peary, and was assailed from many sources. To his critics Cook replied: "I honestly believe I have found the North Pole, and I am willing to submit all my evidence to competent scientists, astronomers and explorers." He later submitted his records to a committee of scientists appointed by the University of Copenhagen, with the result that on examination his proofs were found insufficient, his claim was discredited and his honorary degree of Doctor of Science which had been conferred upon him by the University was withdrawn. Cook's narrative describes conditions near the pole in harmony with Peary's testimony in respect to temperature, ice surface and absence of land. This coincidence is held by Cook's friends to indicate that he really reached that region, even though through lack of scientific knowledge he was not able to establish his claim.

The Peary expedition sailed from New York in the steamer Roosevelt in July, 1908, and reached Etah, Greenland, August 8. It passed the winter at Cape Sheridan, engaged in hunting trips and pushing supplies to Cape Columbia where a supply depot was established. Leaving the Roosevelt a start was made for the Pole by dog train on Feb. 15, 1909, the expedition being divided into six sections which started on successive days. The entire expedition comprised 7 white men, 19 Eskimos, 140 dogs and 23 sledges. From Cape Columbia the course was due north over the ice. Sections of the expedition were sent back from time to time, reducing the outfit with the advance northward. Prof. Ross G. Marvin of Cornell University, who turned back at 86° 38′ in charge of the third supporting party, was drowned April 10, when 45 miles north of Cape Columbia. At 87° 48′ the fourth and last supporting party turned back under command of Capt. Bartlett of the Roosevelt. Peary, now the only remaining white man, with Hensen, a Negro who had been with him on a former expedition, and four Eskimos now pushed forward with all possible speed. Conditions were favorable, the ice comparatively free from obstacles, the temperature rose to 15° below zero, and rapid progress was made. A march of thirty miles was recorded on the last day. At last on April 6 the Pole was reached. Here thirty hours were spent in taking observations, taking photographs, planting flags etc. The return trip was over the trail that had been made. Cape Columbia was reached on April 23, and the Roosevelt at Cape Sheridan four days later.


NORTH POLE
Peary April 6, 1909
April 4
April 2
Peary April 21, 1906
March 27
March 23
March 18
Peary April 21, 1902
Peary May 22, 1900
GREENLAND SEA
ARCTIC OCEAN
GREENLAND
Longitude West from Greenwich
PEARY'S ROUTES
1908-9
1906
1902
1900
1898-5
1892
SCALE OF MILES
0 50 100 200 300
CROCKER LAND Seen by Peary 1906
Peary June, 1906
C. Columbia
GRANT LAND
C. Sheridan
PEARY LAND
HALL LAND
GRINNELL LAND
Kane Basin
Crown Prince Gustav Sea
AXEL HEIBERG LAND
C. Sabine
Etah
HAYES PENINSULA
Cape York
ELLESMERE LAND
KING OSCAR LAND
Smith Sd.
PARRY ISLANDS
BANKS LAND
Jones Sd.
BAFFIN BAY
KING HAAKON PLATEAU
Amundsen Dec 16, 1911
SOUTH POLE
KING EDWARD PLATEAU
Shackelton 1909 88°23′
South Victoria Land
Scott Base 1911-12
King Edward Land
ROSS BARRIER
MOUNT EREBUS
ROSS SEA
Amundsen's Base 1911-12
Adelie Land
Limit of Pack Ice
Antartic Circle

ROUTES OF THE DISCOVERERS OF THE POLES

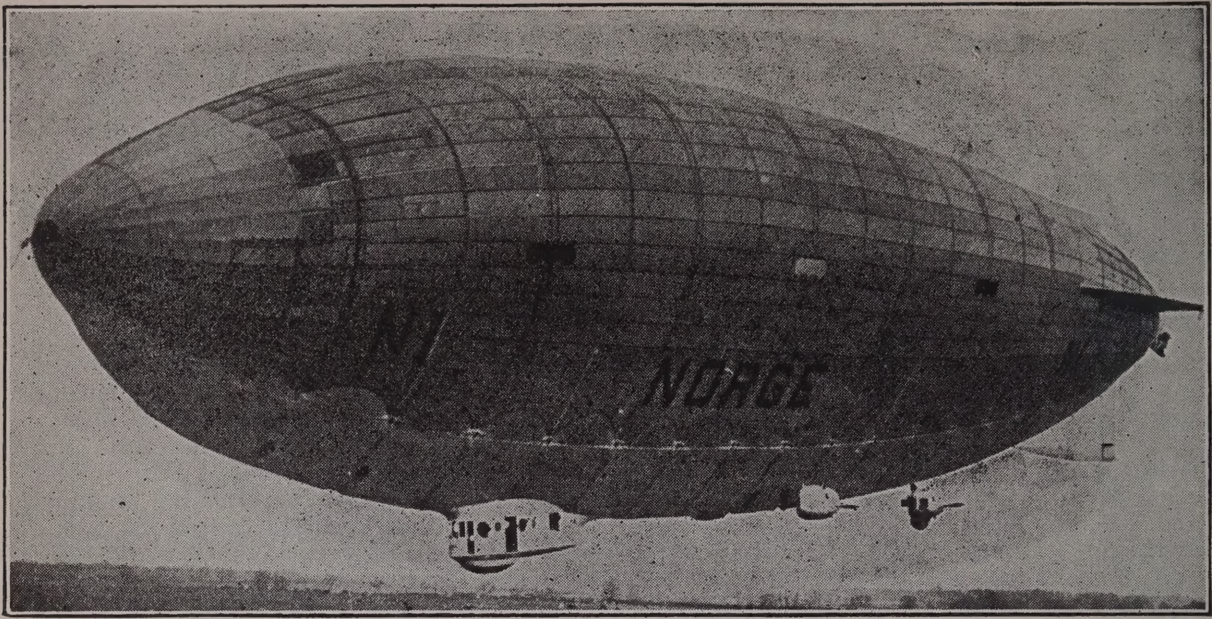
Sailing south July 18, Indian Harbor was reached Sept. 5, from which point the wireless message was sent to the world.

Both Peary and Cook state that conditions for travel were more favorable in the region near the Pole than in lower latitudes. The ice was less rough, there were fewer leads, fewer ridges formed by ice pressure, and the temperature was not so low. Cook reported a temperature of 83 degrees below zero at Ellesmere Sound. Peary reported a minimum of 59 below between the 84th and 85th parallel, while at the 89th the temperature rose to 15 below, and at the Pole the minimum was 33 below zero. Cook reported a minimum of 38°. There was no land and no life; a dead sea of ice and snow.

Few attempts to penetrate the unknown regions of the southern or antarctic pole were made, after the expeditions of Wilkes, d'Urville and Ross (1839–43), until recent years. Knowledge of these regions is valuable only from a scientific point of view. But in 1892 Larsen of Norway discovered fossils in 64° 10′ S., 57° W., which interested him as showing that the antarctic regions were once covered by coniferous trees. Next year Larsen led an expedition through this region, reaching 68° 10′ S. and 60° W. The coasts were high, rocky and [mostly covered with ice. Seven islands were discovered, two covered with volcanoes. In 1894 Foyn, visiting the southern seas in search of whales, reached 74° S., and on Jan. 23, 1895, a landing was made at Possession Island. The first vegetable growth (a lichen) ever found within the antarctic circle was found at Cape Adare and Possession Island by C. E. Borchgrevink, a Norwegian, while upon this expedition. Part of the lands supposed by previous explorers to constitute islands were found to be joined to the main land of the antarctic continent; and lands supposed to be islands by the earliest explorers were found to be surrounded by water. In 1898–9 a British expedition under Borchgrevink reached 78° 50′ S. In 1901 English, German and Norwegian expeditions sailed to see whether there is an antarctic continent. In 1904 Charcot of France wintered off the western coast of Graham Land, south of Cape Horn, and in 1908 he headed another French expedition. Arctowski, a member of the Belgica expedition of 1897–9 organized a Belgian expedition in 1908 to make a circumpolar voyage, with special attention to the region between Graham and King Edward Lands.

In August, 1901, an antarctic expedition sailed from England on the Discovery, in command of Captain Scott, reached Victoria Land in December and wintered at the foot of Mt. Erebus. In September, the beginning of the antarctic spring, Captain Scott pushed forward with a sledge party and reached 82 degrees and 17 seconds, the farthest south up to that date. This expedition was followed by that of Lieutenant Shackleton, who sailed from England on the Nimrod in August, 1907. Shackleton left Lyttleton, New Zealand, Jan. 1, 1908, and reached McMurdo Sound, where winter quarters were established on Cape Royds. September 22 a division was sent in search of the magnetic pole, and on Oct. 28 Shackleton with three others started on the long sledge journey toward the South Pole. During nearly the whole course they were beset with hardships and perils. A final march was made January 9, 1909, and latitude 88° 23′ was reached, one hundred and eleven miles from the Pole, the altitude being between 10,000 and 11,000 feet above the sea level. Both food and endurance were so nearly exhausted that to go further was out of the question. Returning Shackleton reached New Zealand March 22, 1909. The results of the expedition were important. The Magnetic Pole was located at 75° 45′ south, longitude 145°. It was established that the Great Southern Ice Barrier is bounded by mountains running in a south-easterly direction from 78° south to 85° south at least, and that an immense glacier leads to a plateau over 10,000 feet above the sea level, on which is situated the geographical South Pole. Rock formations show that at some period a warm climate prevailed in these regions.

Stimulated by Shackleton's report, and also by Peary's capture of the North Pole, no less than five expeditions soon followed in search of the South Pole—Capt. Scott's (English), Dr. Mawson's (Australian), Lieut. Shirase's (Japanese), Lieut. Filchner's (German) and Roald Amundsen's (Norwegian). The prize was won by Amundsen, who sailed from Norway in 1910, in the *Fram*, the vessel in which Nansen had sought the North Pole. He reached Whales Bay early in 1911, and there went into winter quarters. He pushed on in February as far as 84° south latitude and established depots of food supplies at intervals, returning to winter quarters. The sun disappeared April 22 and returned Aug. 24. On Sept. 8 he started for the Pole. Finding conditions unfavorable he returned to winter quarters and waited until Oct. 20, when with 5 men, 4 sledges and 52 dogs he again started south. On Nov. 17 he reached the great ice barrier, latitude 85°, and climbed to the top of the polar plateau, to a height of 10,000 feet. Here he killed 24 dogs, and with 18 dogs and three sledges pushed on over a vast plateau clad in snow and glacier ice, reaching the Pole Dec. 14. Here he remained three days. On the 16th he took observations every hour for 24 hours, and located the Pole in a vast plain, which he named King Haakon VII Plateau. Here he planted the Norwegian flag and a *Fram* pennant. Returning he reached his winter quarters Jan. 25, and on March 7 from Tasmania he announced by



Keystone View

THE NORGE. Used for the Amundsen-Ellsworth Expedition

AIR KINGS WHO HAVE DEFEATED THE FROST KING IN POLAR REGIONS

On May 9, **1926**, the North Pole was visited the second time by human beings. The first time it was reached was when Robert E. Perry trekked overland by dog-train to arrive April 6, 1909, after he had been away from civilization 429 days. Then came Commander R. E. Byrd and Pilot F. G. Bennett. In the Fokker monoplane *Josephine Ford* they left Kings Bay, Spitzbergen, traveled 750 miles, circled the pole May 9, 1926, and returned to Kings Bay. They had been out of contact with civilization less than 16 hours.

Four instruments helped to conquer the air: two of them were the Byrd bubble sextant and the Bumstead sun compass, both explained in the accompanying illustrations; the third was the wind drift indicator (what its name implies); the fourth was the electric compass. This last consists essentially of a revolving coil, so adjusted that when it revolves parallel with the earth's magnetic field an indicator points north.

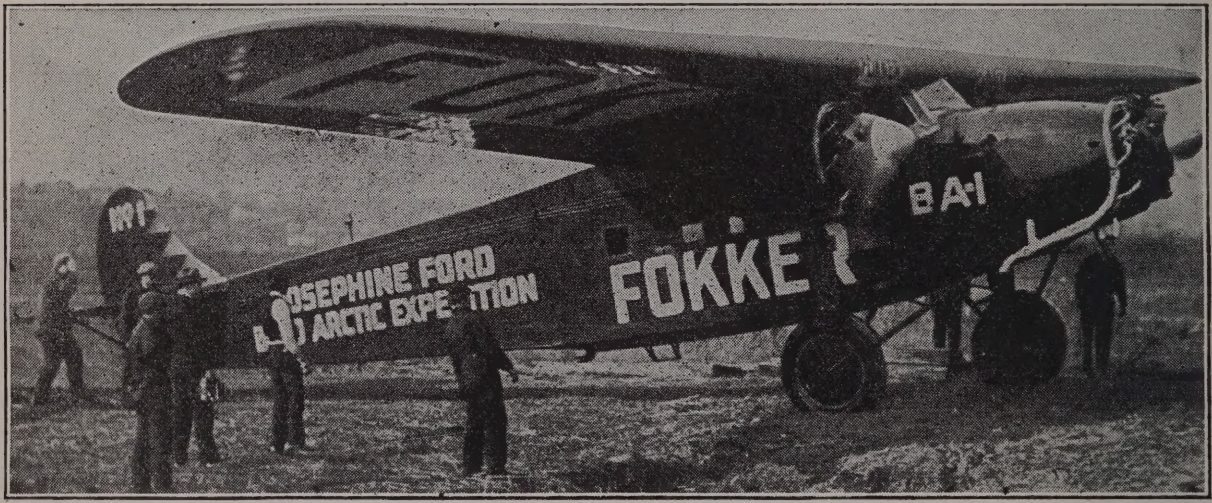
On May 11, 1926, the Italian dirigible *Norge*, piloted by Umberto Nobile of Italy and commanded by Roald Amundsen and Lincoln Ellsworth of the United States, rose over Kings Bay. On board were seventeen men and twelve tons of load. The ship reached the pole after 17½ hours, and continued towards Alaska. Beneath them stretched a hitherto unexplored ice area. They abandoned the project entertained of making Nome, and on May 14, 1926, the men arrived at Teller. Like Byrd's plane their ship had the best modern instruments. Equipped with them and with high resolve, the men had traversed 2,690 miles in the face of sleet and hail that ripped canvas and weighted the ship.

Fotograms

R. E. BYRD

Fotograms

F. G. BENNETT



Fotograms

AIRPLANE JOSEPHINE FORD

Giant Fokker used by Lieutenant Commander Byrd in his flight over North Pole cable that he had attained the Pole. Amundsen found the temperature at the Pole only 9.4 below zero in Antarctic summer. Scott reached the Pole also and found Amundsen's records, but perished on his return journey. (See Scott, R. F.)

From this time on efforts to reach both the North and the South Pole were confined to aërial expeditions, although any number of land expeditions of an exploratory character were made into the Arctic, especially by Commander MacMillan. On May 21, 1925, Amundsen with two men in the N-25 and Lincoln Ellsworth with two companions in the N-24 started from Kings Bay, Svalbard (Spitzbergen), for the North Pole. A westerly drift cost them the fuel necessary to reach their goal and they were forced down within 136 miles of the Pole. They devoted their energies to getting the N-25 into the air. After many failures this was accomplished on June 15 and the entire company reached the coast of Svalbard, where they were rescued by a sealer.

In 1926 there was a renewal of aërial flights into the Arctic. On May 9, Commander Byrd with Floyd Bennett as his pilot flew the Fokker plane *Josephine Ford* over the North Pole and returned to his base in fifteen and one-half hours. No new land was sighted over the 9,000 square miles of territory which previously had been untraversed. On May 13, 1926, the Amundsen-Ellsworth-Nobile Transpolar Expedition completed a 71-hour flight over the North Pole in the dirigible *Norge* from Kings Bay, Svalbard, to Teller, Alaska.

On March 29, 1927, Captain Sir George Hubert Wilkins and Lieutenant Ben Eielson left Point Barrow in an airplane which carried, it was thought, enough fuel for a 1,400-mile flight. After flying some 550 miles over the Arctic Ocean their plane was forced down by engine trouble. Temporary repairs were made and they started a return flight to Point Barrow, but were again forced to land. Upon resuming the flight they were struck by a blizzard and their gas supply ran out. In landing they struck rough ice which damaged the machine. They made sledges from the woodwork, and after overcoming extraordinary obstacles managed to reach an Eskimo camp at Beechey Point. In 1928 the two explorers made a second and successful flight. No attempt was made to reach the North Pole, the objectives of the expedition being to seek for new land (none of which was found), to study the feasibility of establishing a meteorological station in the Far North, and to prove the efficiency of the airplane in high latitudes. In twenty-one and one-half hours the fliers covered the distance from Point Barrow, Alaska, to Dead Man's Island, Svalbard (Spitzbergen).

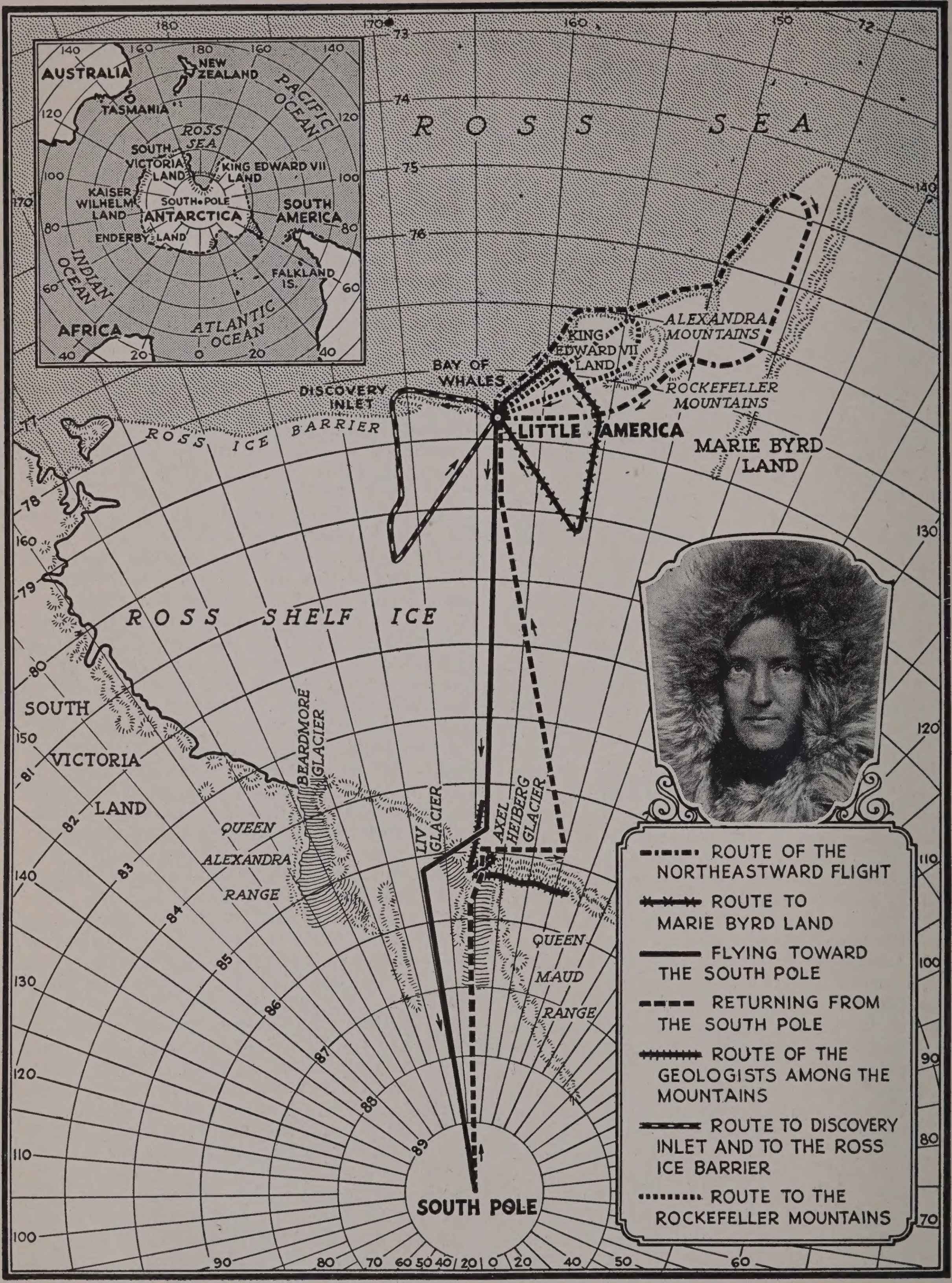
In May, 1928, the dirigible *Italia*, under the command of General Umberto Nobile, made three flights from Kings Bay, Svalbard. The first trip to Franz Josef Land, was cut short because of fog. The second was over previously unexplored territory in the vicinity of Northern Land. On the third flight, which reached the North Pole, the dirigible was wrecked while returning. Two weeks later communication was established by radio between the occupants of the main gondola, which had been torn from the rest of the ship, and the base ship of the expedition. After heroic efforts, eight of the crew were rescued, but eight were lost. In an effort to go to their rescue, Captain Roald Amundsen and five others disappeared.

During the winter of 1928-29, Commander (now Rear Admiral) Richard E. Byrd and his expedition established themselves on the ice at the edge of the Bay of Whales, Ross Sea, in preparation for extended exploration of the Antarctic Continent. The expedition had left the United States in four ships during the autumn of 1928. Little America was established as the base of the expedition on January 6, 1929. On November 28, 1929, the flight over the South Pole was begun by Commander Byrd, Bernt Balchen and Harold June as pilots, and Ashley McKinley as photographer. The fliers achieved their goal and returned to Little America without mishap. Other flights were made and on December 5 a new mountain range was discovered.

At the same time, Captain Sir George Hubert Wilkins and his pilot, Lieutenant Eielson, were exploring the other side of the Antarctic Continent. They discovered that Graham Land was in fact two islands, which are now designated North Graham Island and South Graham Island. On December 31, 1929, a short flight over Charcot Island and to the south added some 300 miles to the known coast line of the Antarctic Continent.

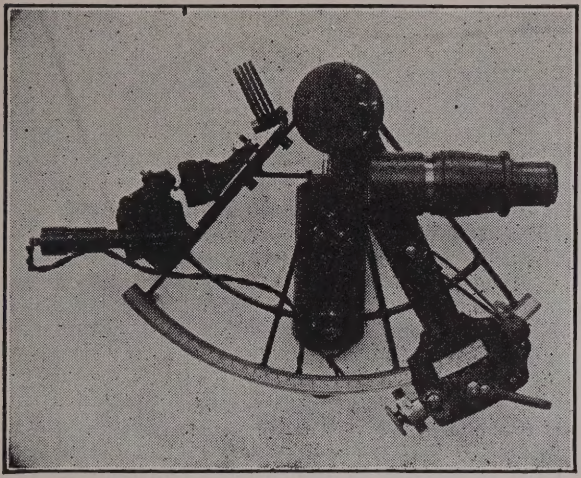
The most northerly radio-meteorological station in the world was established on Hooker Island, Franz Josef Land, in 1929. The equipment was taken there by the Soviet ice-breaker *Sedov*, and on August 30 the first message was sent from the new station, which was to be operated throughout the year. On August 6, 1930, the remains of the ill-fated balloon expedition of Salomon Andree, which had not been heard of since 1897, were discovered on White Island by Dr. S. Horn, leader of a Norwegian scientific expedition. In 1897 Andree, accompanied by Nils Strindberg and Knut Fraenkel, left Virgo, Spitzbergen, on board the balloon *Ornen* for the North Pole. According to Andree's diary, which was found in his clothes, the balloon was forced down after carrying the party only 117 miles toward the Pole. The three men abandoned it and march southward across the ice. Fraenkel died on the way; Andree and Strindberg reached White Island, but perished there.

In 1933-34 Admiral Byrd was engaged in another expedition to the Antarctic, again using Little America as his base. Captain

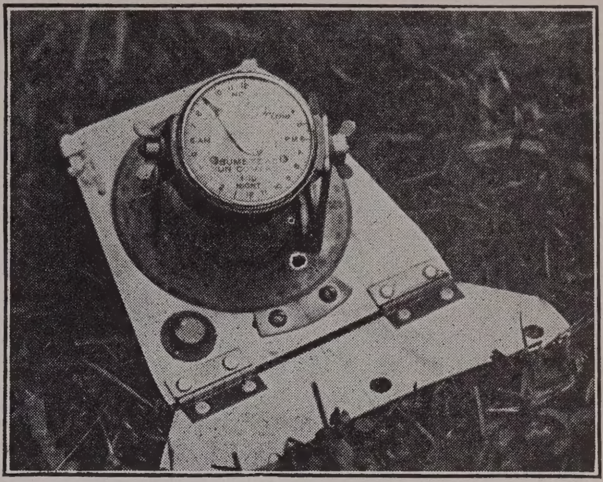

AUSTRALIA
NEW ZEALAND
TASMANIA
PACIFIC OCEAN
ROSS SEA
SOUTH VICTORIA LAND
KING EDWARD VII LAND
KAISER WILHELM LAND
SOUTH POLE
ANTARCTICA
SOUTH AMERICA
ENDERBY LAND
INDIAN OCEAN
FALKLAND IS.
AFRICA
ATLANTIC OCEAN
ROSS SEA
BAY OF WHALES
DISCOVERY INLET
ROSS ICE BARRIER
KING EDWARD VII LAND
ALEXANDRA MOUNTAINS
ROCKEFELLER MOUNTAINS
LITTLE AMERICA
MARIE BYRD LAND
ROSS SHELF ICE
SOUTH VICTORIA LAND
BEARDMORE GLACIER
LIV GLACIER
AXEL HEIBERG GLACIER
QUEEN ALEXANDRA RANGE
QUEEN MAUD RANGE
SOUTH POLE
ROUTE OF THE NORTHEASTWARD FLIGHT
ROUTE TO MARIE BYRD LAND
FLYING TOWARD THE SOUTH POLE
RETURNING FROM THE SOUTH POLE
ROUTE OF THE GEOLOGISTS AMONG THE MOUNTAINS
ROUTE TO DISCOVERY INLET AND TO THE ROSS ICE BARRIER
ROUTE TO THE ROCKEFELLER MOUNTAINS

Portrait of Rear Admiral Byrd © by Wide World Studio

NEW INSTRUMENTS WHICH HELPED FLYERS FIND THE POLE



Bureau of Standards



Keystone View

BYRD BUBBLE SEXTANT

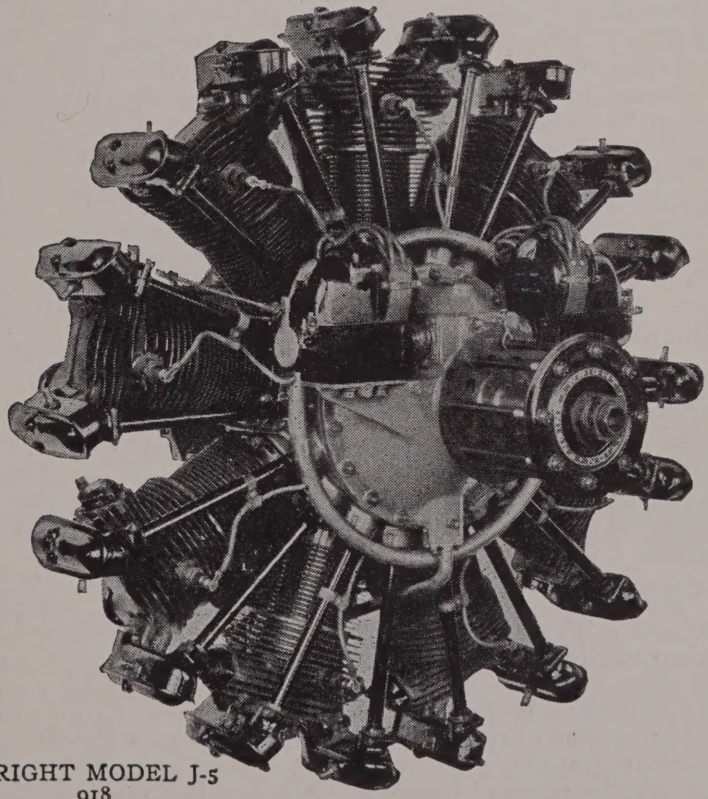
Mariners use the ordinary sextant to determine the height of the sun above the horizon. Mirrors split the line of vision in the sighting tube so that the sun can be made to seem brought down from its position in the sky to the horizon. Of course what actually happens is that the reflected image of the sun is brought down, by angular adjustment of the compass, to the horizon. With known corrections, the angle reading then shows the height of the sun above the horizon.

Commander Byrd, flying high in the air, could not use the real horizon as the seaman can. So he made a bubble level and attached it to the sextant. This level was fixed so that it took the place of the horizon.

BUMSTEAD SUN COMPASS

Within the Arctic Circle during the warm six months the sun never sets. It would throw a shadow, in a 24-hour period, which would travel once around a post planted at the north pole. Commander Byrd carried a dial with a perpendicular pin. A moving hand, regulated by clockwork, swept once around this dial in 24 hours, in time with the sun. When the plane was pointed due north, the shadow of the sun would fall on the revolving hand. Thereafter it was only necessary to keep the plane in such a position that the shadow of the sun always fell on the hand. This sun compass was impractical in fog. But a navigator feels safer if he has several directing instruments, so results may be checked with each other.

THE ENGINE THAT HAS DRIVEN AIRPLANES ACROSS THE ATLANTIC



Courtesy Wright Aeronautical Corp.

A CLOSE VIEW OF THE WRIGHT WHIRLWIND MOTOR, SHOWING AIR-COOLED CYLINDERS.

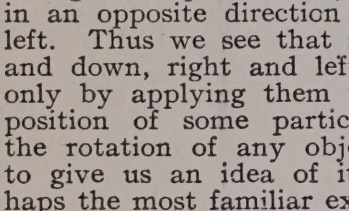
Sir George Hubert Wilkins was also making another trip to the Antarctic with a party which included Bernt Balchen, one of those who accompanied Byrd on his flight over the South Pole.

See Amundsen; Peary, etc.

Polar Lights. See Aurora Borealis.

Polar′ity. This is a term difficult to define, except by such examples and illustrations as the two poles of the earth (ends of the axis on which it revolves) and the north and south poles of a magnet. A globe or sphere not in motion presents the same aspect in every direction; but let it begin to rotate about some diameter, and at once it becomes a polar body. Looked at from one end, it appears to rotate from left to right like the hands of a clock or watch; looked at from the other, it appears to rotate in a counter direction or from right to left. To any one in the northern hemisphere looking toward the equator, the sun and other heavenly bodies appear to move from left to right; but to people of the southern hemisphere, facing the equator, they appear to move in an opposite direction or from right to left. Thus we see that such terms as up and down, right and left, can be defined only by applying them to the motion or position of some particular object; and the rotation of any object may be used to give us an idea of its polarity. Perhaps the most familiar example of polarity is the magnet. Its polarity is a force polarity, the ends or poles of one magnet having a selective action upon the ends or poles of the other. This particular action, however, is only one among many manifestations of magnetism; and the general tendency among scientists is to explain all magnetic phenomena as essentially *rotational*, the difference in the poles of the magnet being accounted for by the theory of revolving currents of electricity in planes perpendicular to the direction of the magnetic force.

Po′lariza′tion of Light. In the evidence which is ordinarily adduced for thinking that light consists in a wave-motion of the ether nothing is said as to whether light vibrations are longitudinal, as is the case with sound, or transversal, as is the case with water-waves. The phenomenon which answers this question decisively is the polarization of light.



TOURMALINE PLATES

The facts are as follows: If we take a thin slice of a tourmaline crystal, cut parallel to its crystallographic axis, and examine the light which passes through it from any ordinary source of illumination, say the sky, we shall find the transmitted light of a greenish, olive color. If we take a second crystal exactly like the preceding, and place it on top of the first crystal, in such a way that the axes of the two are parallel, we shall find the light transmitted as before, only with greater absorption, since it now has to pass through a greater thickness. Suppose, however, that we rotate one crystal upon the other, so that their axes no longer are parallel although their faces remain in contact; we shall find that the second crystal becomes less and less able to transmit the light delivered to it by the first crystal and when the second crystal has been so turned as to have its axis at right angles to the axis of the first crystal, *no light at all will pass through both crystals.* This latter position is shown in B, Fig. 1; the former position, with axes parallel, is shown at A, Fig. 1. The ray of light is here to be imagined as falling upon the plate of tourmaline in a direction which is perpendicular to the plane of the drawing. Either crystal alone will transmit the original ray however the crystal be placed; but either crystal alone behaves very differently toward a ray which has once passed through a piece of tourmaline. In fact the passage of the ray through the tourmaline has given it a new property; for it now behaves differently in different azimuths. [An azimuth is an arc of the horizon intercepted between the meridian of the place and a vertical circle passing through the center of any object.] Such a ray is said to be *polarized.* The fact that it has different properties on different sides, so to speak, proves that light-waves must be transversal. If the disturbance in the ether were "end on," as in the case of sound, it could not possibly make any difference how one rotated the tourmaline through which the light is viewed.

In the early part of the 19th century it was discovered by Malus that light which has been reflected from any polished surface has this property, which is called polarization, in a greater or less degree; and when reflection occurs at a definite angle, known as the angle of polarization, the reflected beam is almost completely polarized. It has been proved by Hertz and Trouton that the vibrations in polarized light are at right angles to the plane of polarization.

Pol′der, in the Netherlands, is land below the level of the nearest water, which, originally a morass or lake, has been drained and brought under cultivation. An embankment forming a canal high enough to carry the water to the sea or a river is made and apparatus for lifting the water is placed at one or more points. If the lake deepens toward the center, several canals become necessary, formed at different levels as the water surface lessens, a connection being maintained with each other and with the first or outer canal which carries the water to the sea or river. In Schermer Polder in North Holland are four canal levels, the land between them forming long parallelograms.

Pole'cat, a carnivourous animal with a long, slim body like a weasel. Four species inhabit the northern hemisphere. The common polecat of Europe is dark brown above and black below. Its fur is of little value. They sleep by day, and at night plunder poultry-yards and dove-cotes. They feed also on rabbits, rats, mice and birds. Very similar species are found in Siberia, Tibet and North America. These animals emit a foul odor when disturbed. The ferret is a domesticated variety of polecat. In the United States the name sometimes is applied to the skunk incorrectly.

Poles (Greek *polos*, a turning point), in geography are the two extremities of the axis round which the earth revolves, the north pole being 90° north of the equator and the south pole 90° south. In astronomy the poles, which for distinction are called celestial poles, are those points in the heavens to which the earth's axis is directed and round which the heavens seem to revolve. Unfortunately no stars mark the exact position of the celestial poles, and therefore the polestar is used for this purpose, its exact position being determined by noting the point between its upper and lower *culminations.* The term poles also has a wider application as denoting the extremities of a line passing through the center of a great circle perpendicular to its plane. Thus we have the poles of the horizon (which are the zenith and the nadir), the poles of the ecliptic and the poles of a meridian. In the same sense the terrestial and celestial poles are spoken of as the poles of the equator and the equinoctial, respectively. Poles in physics denote those points of a body at which its attractive or repulsive force is concentrated.

Pole'star or **Pola'ris,** the star nearest to the northern pole of the celestial quarter. The star which at present goes under the name of the polestar is *Alpha* in the constellation of *Ursa Minor.* This star, however, is a little more than 1° from the north pole and has a sensible motion around it. This star will in about 2,100 A. D. come within 28′ of the north pole of the heavens, and then recede. Two thousand years ago *Beta* of *Ursa Minor* was the polestar, and about 2,300 B. C. *Alpha* in the constellation of the Dragon was not more than 10′ from the north pole, while 12,000 years after the present time the bright star *Vega* in *Lyra* will be within 5° of it.

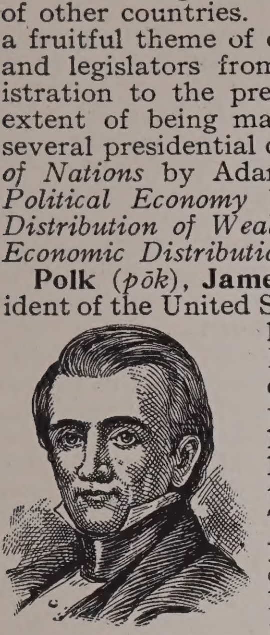
Pole-Vault'ing is one of the sports called field-events. It consists in leaping over a bar by means of a pole. Usually this is 16 feet long. The contestant grasps the pole above his head, measures the height of the bar with his eye, and runs forward. At a certain distance from the bar he thrusts the pole into the ground, leaps up, and throws himself forward and up over the bar, at the same time flinging the pole behind him. Generally three trials at different heights are made. The highest record is 12 feet nine inches.

Police (*pō-lēs'*) are an organized force — especially in towns and cities — for the preservation of peace and order and the prevention of crime. This definition applies more particularly to the police of the United States and of England, as the police of most European countries have much wider functions, and are often used by rulers and ministers for political purposes and in a more or less oppressive manner. The existing sytem of police administration in England is of recent origin, and many features of it were introduced during the reign of Queen Victoria. In the early periods of English history there was no such thing as a separate body of police, the responsibility for the maintenance of the peace being imposed on each hundred or tithing and the individuals composing these divisions being held jointly liable for the consequences of any violations of law which occurred within their limits. In the larger towns the inhabitants of the various wards kept watch within their limits, special watchmen being gradually introduced; but these duties of watch and ward were performed very inefficiently, and crimes were committed with marked impunity, especially in London and other large cities. During the 18th century various efforts were made to remedy this state of things in London and to secure a more efficient administration both in the prevention and detection of crime; but the results obtained were very unsatisfactory. In 1829 Sir Robert Peel organized the metropolitan police, placing the new force under the control of the secretary of state, and since that time the police of counties and boroughs have been organized upon the same principles as the metropolitan police, except that they are under the local authority. The strength of this body of metropolitan police was 19,761 in 1911; 31 superintendents, 604 inspectors, 2,620 sergeants and 16,506 constables. The City of London police-force numbers 1,180 men, exclusive of those on private service and detective duty and of those known as metropolitan police. The police-force throughout the kingdom is a civil, not a military body, with the exception of the royal Irish constabulary, which is more military than civil. This force is directly under the Irish government, and its members are armed and drilled as soldiers. It consisted in 1905 of 11,338 members under the command of an inspector-general, each county being supervised by a county-inspector and divided into separate districts over which are placed district-inspectors. Below these officers are sergeants and constables, trained in the use of arms and disciplined as soldiers. The police-force of Scotland numbered 5,356 and of England and Wales 45,202.

In the United States each town or city has its separate administration; but, in general, the police-system is much like that of England. The present police organization of New York, which was substituted for the inefficient night-watch in 1845, may be taken as a type of the American system generally. It consists of a board of police, comprising four commissioners appointed by the mayor, and the police-force, who with their various officers are appointed by the board. The city is divided into four inspection-districts, which are subdivided into 35 precincts. At the head of the force are a commissioner and deputies, a chief inspector, under whom are one borough and 12 district-inspectors, a captain over each precinct, sergeants, roundsmen (visiting officers), patrolmen (the body of the force) and doormen at the stations, besides 23 surgeons and 68 police-matrons. The captains report every morning to the central office. The roundsmen must see that the patrolmen perform their duties, and the sergeants are responsible for both. Besides the general force there are several bodies or squads organized for special services. Among these are the sanitary police, the detective-force, the harbor-police, park-police and two boiler-inspectors. In 1911 the police-force of Greater New York numbered 10,136 men, of whom 8,564 were patrolmen, the annual cost of the entire force being about 15 million dollars. The police-force of Chicago—now the second city in the Union—during the year 1910 numbered 4,260 and cost $5,825,454.

Polit'ical Econ'omy has various definitions; but there is a general agreement that it is the science relating to the production, distribution and exchange of wealth. The word is derived from the Greek words *oikos* for house and *nomos* for law or rule; but in its wider application it refers not only to the laws and institutions of nations in reference to industry and trade but to the arrangements of Providence in reference to the supply of man's physical wants. Although economic questions of various kinds occupied the minds of the Greeks and some other ancient nations and were discussed by their leading thinkers and writers, there was no real science or system of political economy until the time of Adam Smith and his forerunners in the 18th century. Smith's *Wealth of Nations* was the first systematic exposition of the subject by a man thoroughly qualified for his task; and his teaching was defined by himself as a system of natural liberty. He opposed all regulations and restrictions of trade, as protective tariffs, that seem to interfere with the natural order of things, thus following the school of Rousseau in advocating a return to nature from what he deemed a perverted civilization. He also followed the example of his predecessors, and showed himself in harmony with the new era by making labor the source of wealth. The greatness of Smith's work lies in the fact that he summed up the best thought of preceding times and that his writings have been made the basis of all subsequent progress in economic science. But great as his influence has been, his ideas have by no means commanded general acceptance. His system has been variously criticised as too abstract and merely theoretical; and his followers have been characterized as "students of maxims rather than markets." The strongest point, perhaps, that is urged against him and his school is that they overlook the importance of the *nation* as the unit in economic growth and development. In answer to Smith's various arguments it is urged that economic questions must be studied in the light of actual conditions in each state or nation and that the wise policy can be determined only from a knowledge of all the factors that enter into industry and trade. Great changes have also taken place since Smith's time, which have added new complications to the questions at issue and have placed political economy in a still more unsettled and unsatisfactory condition. Among these changes the most important is the introduction of machinery, by which individual enterprises have given place to vast corporations and trusts, thus making the relations between capital and labor one of the leading questions in political economy; and it is urged with great force that the concentrations of capital make such a condition in the industrial world that the various issues between capital and labor cannot be settled by the mere "law of supply and demand," but that moral principles must also be invoked. Hence the relation of political economy to ethics must be considered by students of the science in our time.

In the United States one of the leading questions in political economy is that of high or low tariff. While individual opinions range from the extreme positions of absolute free trade (the admission of all foreign imports without duty) to tariff rates that would almost prohibit the introduction of foreign products, the Republican and Democratic parties may be said to be divided on the question whether tariff duties should be levied on foreign imports for purposes of revenue only or whether we should also have a "system of protection" under which our manufactures should be secured against competition with those of other countries. This question has been a fruitful theme of discussion by statesmen and legislators from Washington's administration to the present time, even to the extent of being made the leading issue in several presidential campaigns. See *Wealth of Nations* by Adam Smith; *Principles of Political Economy* by J. S. Mill; Clark's *Distribution of Wealth;* and Hobson's *The Economic Distribution.*



JAMES K. POLK

Polk (*pōk*), **James Knox,** eleventh president of the United States, was born in Mecklenburg County, N. C., Nov. 2, 1795. He was educated at the University of North Carolina, and after studying law was admitted to the bar at Columbia, Tenn., in 1820. Three years after this he was chosen a member of the legislature, and in 1825 was elected to Congress as a Democrat. In 1835 he was made speaker of the house of representatives, a position which he filled with credit and ability. In 1844 he was the Democratic candidate for the presidency against Henry Clay, and was elected by a popular majority of only 38,000 but by an electoral vote of 175 to 105. The principal feature of Polk's administration was the Mexican War, by which the United States acquired Texas, California and New Mexico (then including Arizona). Texas was annexed just before Polk's inauguration; and soon after he became president he sent General Taylor to occupy the disputed territory between the Nueces and Rio Grande, Mexico claiming that this territory never belonged to Texas. In March, 1846, Taylor advanced to the Rio Grande and built Fort Brown, opposite the Mexican port of Matamoras. General Arista, the Mexican commander, then crossed the Rio Grande to attack Taylor, but was defeated at Palo Alto and Resaca de la Palma, and forced to recross the river. War was at once declared by Congress against Mexico and was prosecuted with energy and vigor until the City of Mexico was occupied by General Scott in September, 1847. During Polk's administration, by a compromise treaty with England, the northern boundary line of Oregon territory — now the state of Washington — was fixed at 49°. The low-tariff act of 1846 was a favorite measure of Polk's, being passed in the senate by the casting vote of Vice-president Dallas. Other features of his administration were the admission of Wisconsin as a state in 1848; the adoption of the subtreasury system by which the funds of the government are kept in vaults in Washington instead of being deposited in banks; and the creation of the interior department, its secretary being added to the cabinet. On the expiring of Polk's term he retired to his home, Nashville, Tenn., where he died, June 15, 1849.

Polk, Leon'idas, general in the Confederate army and bishop of the Protestant Episcopal church, was born at Raleigh, N. C., April 10, 1806. He graduated at West Point in 1827 and received a commission in the artillery, but resigned and studied for the ministry. In 1838 he was consecrated bishop of Arkansas and Indian Territory, with charge of the dioceses of Alabama, Mississippi and Louisiana; but in 1841 he resigned all except the bishopric of Louisiana, which he held until his death, even when commanding a corps in the Confederate army. Soon after the outbreak of the Civil War Bishop Polk tendered his services to the Confederate government, and was appointed major-general by Jefferson Davis. He commanded an army-corps at Shiloh, and in October following was made lieutenant-general. At Chickamauga he commanded the right wing of Bragg's army, and, being charged by that officer with disobedience of orders, was relieved of his command for a short time, but was afterward restored, and served under Gen. Joseph E. Johnston in Sherman's Atlanta campaign. He was killed by a cannon-shot while reconnoitering on Pine Mountain, June 14, 1864.

Pol'len, the microspores of seed-plants. Pollen is developed within pollen-sacs, which occur on the anthers of stamens. Each pollen-grain is an asexual spore, consisting of a single cell, which has an outer heavy and more or less modified wall, known as the exine, and a delicate inner wall, known as the intine. Pollen-grains are often variously marked, sculptured and even winged by the modifications of the exine. Certain pollen-grains, as those of the mallows, are covered with conspicuous spiny points, and this family may be recognized by its pollen. Pollen has often been mistaken as the equivalent of a male cell, being spoken of as the male element. It should be distinctly understood that pollen grains are microspores and that microspores are asexual spores. When the pollen germinates, as other spores do, it produces a male gametophyte, as do all microspores. It is in connection with this new plantlet or male gametophyte that the sperms are developed.

Pol'lina'tion, the transfer of the pollen of plants from the stamen which produces it to the stigma which is prepared to receive it. Pollination is frequently confused with fertilization. Fertilization is the union of the male cell and egg, which may or may not follow pollination. In general this transfer of pollen is effected by one of two agents, the wind or insects. The plants which use wind as a carrier of pollen are called anemophilous plants; those which use insects for this purpose are called entomophilous. The gymnosperms and many of the more primitive angiosperms, as grasses and many of the common trees, are anemophilous. The great majority of angiosperms are entomophilous, and their flowers have been modified in every way to be adapted to insect-visits, and the insects have been variously adapted to flowers. For anemophilous pollination see GYMNOSPERMS. Entomophilous pollination is of two kinds: namely, self-pollination, in which the pollen is transferred to the stigma of its own flower; and cross-pollination, in which the pollen is transferred to the stigma of some other flower. In the case of cross-pollination the two flowers concerned may be upon different plants which may be quite distant from one another. The advantage of this relation to the insects is to secure food. This the flower provides either in the form of nectar or pollen, and the insects which pollinate flowers may be roughly divided into the two groups of nectar-feeding insects, represented by butterflies and moths, and the pollen-feeding insects, represented by bees, wasps etc. The presence of these food-supplies is made known to the insect by odor, form and, perhaps, color of flowers. Those insects which are suitable for this work are necessarily flying forms, as creeping insects would brush off the pollen from their bodies in passing from one flower to another. Plants have many devices by which such unsuitable creeping insects as ants may be warded off. Just what the advantage of cross-pollination over self-pollination may be is not clear, but that it is of great advantage is evident from the fact that the angiosperms have made most elaborate attempts to secure it. In most insect-pollinating flowers there are three problems: To hinder self-pollination; to secure the visits of suitable insects; and to ward off the visits of unsuitable insects. Most of the insect-pollinating flowers may fall into three great divisions on the basis of the methods they use to hinder self-pollination. The first division includes those flowers in which the pollen and stigma are so related to each other in position that the pollen is not likely to fall upon the stigma. This method results in much of the irregularity of flowers, and conspicuous among these forms are the sweet peas, irises and orchids. The story of cross-pollination in orchards has been told by Darwin in a wonderfully interesting book. The second division includes those flowers in which self-pollination is prevented, not by the relative positions of the parts, but by the fact that the pollen and stigma are not ready at the same time. When the stigma is ready to receive, the pollen may not be ready for shedding; or when the pollen is ready for shedding, the stigma may not be ready to receive. These are the so-called dichogamous flowers (which see). It is evident that there may be two groups upon this basis: Those flowers in which the pollen is ready first and those flowers in which the stigma is ready first. The former are called protandrous the latter protogynous flowers. The third division includes those flowers in which there are at least two forms, and the two forms differ from one another in the relative lengths of their stamens and styles and in the nature of their pollen. For example, in the common houstonia, a small tubular flower, one kind of flower has the stamens included in the tube and the stigmas protruding; while the other kind has the stigmas included in the tube and the stamens protruding. Each kind of pollen is most effective upon the stigma of the same level. Accordingly, as an insect passes from one such flower to another, crowding its way into the tube, its thorax is likely to receive a band of pollen from the short stamens and its abdomen another band from the long stamens. In this way the pollen from the thorax is rubbed upon the included stigmas and the pollen from the abdomen is rubbed upon the protruding stigmas. The whole story of the relation between insects and flowers is an exceedingly intricate one and full of surprises.

JOHN M. COULTER.

Pollin'ium (in plants). In certain families, notably the milkweed and orchid families, all of the pollen-grains formed within a pollen-sac stick together in a mass which is removed bodily by insects. These masses of sticky pollen are pollinia.

Poll-Tax, a tax levied by the *poll* or head. In England the imposition of a graduated poll-tax in the time of Richard III led to Wat Tyler's rebellion in 1381. A similar tax was imposed in 1513. A tax, varying from 12*d* for a private person to £100 for a duke, was assessed in 1678 and abolished in 1689. In the United States some states impose a poll-tax varying from $1 to $3, while in others the imposition of such a tax is expressly forbidden by the state constitution.

Polit'ical Par'ties in the United States began as early as 1787, with the discussions as to framing the national constitution. When the delegates, chosen from the several states, had agreed unanimously upon a form, there was a difference of opinion as to its merits. Prominent among its friends were Washington, Hamilton, Jay and Madison. A series of 82 able papers in its favor, prepared almost wholly by Alexander Hamilton of New York, were published in *The Federalist*. At once those who sided with this view were called Federalists, and the opponents Anti-Federalists. When Washington became president, April 30, 1789, the Federalists came into power, and Alexander Hamilton, as secretary of state, rescued the country from bankruptcy by his splendid financiering. During Washington's second term there was a split in his cabinet, and at its close the Anti-Federalists, headed by Thomas Jefferson and Edmund Randolph, elected their candidate, Thomas Jefferson, as vice-president, although the Federalists elected John Adams as president. The combination was embarrassing; but, as the electoral law has been changed, it cannot again occur. The result was the defeat of Adams for a second term and the election of Jefferson to the presidency. In 1801 the Anti-Federalist administration began and the party name was changed to Republican and, later, to Democrat. This party held power until 1840, although in the election of 1824 there were four candidates, all claiming to be Republicans and one wing, under lead of Adams and Clay being known as National Republicans. They were John Quincy Adams, Andrew Jackson, Henry Clay and W. H. Crawford. As neither was elected by popular vote, the matter was decided by the house of representatives, which placed Adams in the presidential chair. Four years later General Jackson, the "hero of New Orleans," was elected and his administration was noted for opposition to the United States Bank and for putting into practice the doctrine that "to the victor belongs the spoils." The Whig party, which was formed in opposition to the Democratic party and took ground in favor of a protective tariff and internal improvements, led by Daniel Webster and Henry Clay, gained its first success in the election of William Henry Harrison in 1840, but the slavery question and the death of Clay and of Webster, both in 1851, so weakened the Whigs that General Winfield Scott, in spite of his splendid military record, was defeated by Franklin Pierce, and the party ceased to exist in 1852. Several other parties arose: the Anti-Masonic party of 1826; the Liberty party in 1840, which was merged in the Free Soil party in 1848; the American party or Know-Nothings in 1854; the Republican party, made up of the Free Soil party and the anti-slavery wing of the Whigs in 1856; the Constitutional Union party in 1860; the Greenback party in 1866; the Prohibition party in 1872; and the Union Labor party in 1888. In 1856 James Buchanan, the Democratic candidate, was elected, and during his administration the Civil War began. In 1860 Abraham Lincoln was elected by the Republican party, which remained in power until 1884, when Grover Cleveland, the Democratic candidate, was elected. In 1888 the Republicans elected Benjamin Harrison, and in 1892 Grover Cleveland was again elected by the Democratic party. In 1896 the Republicans elected William McKinley, of Ohio, and in 1900 he was given a second term in the presidential chair. His chief opponent in both years was William J. Bryan of Nebraska, the nominee of the Silver Democrat and Populist parties. The other factors in both elections were those marshaled under the banners of the Gold Democrats, the Prohibitionists, the Social Democrats and the Socialist Labor Party. In the contest of 1896 John M. Palmer of Illinois led the forces of the National or Gold Democrats. For vice-president the winning men were Garret A. Hobart of New Jersey in 1896 and Theodore Roosevelt in 1900. On the death of President McKinley (*q. v.*) in September, 1901, Vice-President Roosevelt succeeded to the presidency. In 1904 Theodore Roosevelt was the nominee of the Republican party, and was elected president by an unusual majority, his chief opponent being Alton B. Parker, the nominee of the Democratic party. In 1908 William Jennings Bryan for the third time was nominated by the Democrats, while William Howard Taft was the candidate of the Republicans. The Prohibitionists, Socialists and the Independence League also put forward candidates. The vote resulted in the election of Mr. Taft who was re-nominated in 1912 but was defeated by the Democratic candidate, Woodrow Wilson, after an unusually heated campaign. Theodore Roosevelt led the Progressives, a party which was formed as the result of dissatisfaction with certain of Taft's policies, and the charge that Roosevelt and his delegates had been unfairly treated in the Republican convention. The Progressives crystallized the sentiment in both Republican and Democratic parties in opposition to the control of legislation by large business interests, but drew their strength chiefly from the Republicans. In 1916 the Progressives endorsed Hughes, who was defeated, nevertheless, by Wilson. In 1920 Harding overwhelmingly defeated James M. Cox, governor of Ohio.

Po'lo, an equestrian game, which may be briefly described as hockey on horseback. An oblong space is marked out, the usual size of which is 300 by 200 yards; at each end, in the center of the line, two poles are fixed 20 or 22 feet apart, forming the goals through which it is the object of the opposing sides to strike the ball. The players are mounted on ponies, the size of which should not exceed 14 hands, and each player is armed with a polo-stick, a strong cane about four feet long with a crosshead about eight inches in length, with which to strike the ball of light wood. The proper number of players is four to a side, and in polo, as in most other games, combination is the first condition of success. The ponies need to be carefully trained, and they sometimes become very clever in understanding what is required of them. To become a good player requires a quick eye, good horsemanship and a great deal of practice.

Polo, Marco, the greatest of medieval travelers, was born at Venice about 1254. As a youth he accompanied his father and uncle to the court of Kubla Khan, the ruler of China, then known as Cathay. Pleasing the Khan, he remained for some time in his dominions, learning the language and traveling over the kingdom in the Khan's service. All three Polos amassed wealth and returned, after many adventures, to Venice. In the war between Venice and Genoa Marco was captured by the Genoese and, while in prison, dictated the account of his travels now found in libraries to a fellow prisoner. His stories were very incredulously received by the people of his time. After his liberation he returned to Venice, where he died in 1324, and was buried in the Church of St. Lorenzo. See his work, edited by Henry Yule.

Polybius (*pô-lĭb'ĭ-ŭs*), the Greek historian, was born about 204 B. C. at Megalopolis in Arcadia. He was one of the 1,000 Achæans who, after the conquest of Macedonia in 168 B. C., were sent to Rome on the pretext that the Achæans had failed to assist the Romans against Perseus. At Rome he was the guest of Æmilius Paulus, and became the close friend of his son Scipio Æmilianus, accompanying him in his military expeditions. In 151 B. C. the surviving exiles were permitted to return to Greece; but Polybius followed Scipio in his African campaign, and was present at the destruction of Carthage in 146 B. C. But the war between the Romans and Achæans afterward summoned him to Greece, where he arrived soon after the taking of Corinth; and so grateful were his people for his services in securing favorable terms from their conquerors that they erected statues in his honor in his native city and elsewhere. It was about this time that he undertook the writing of his great historical work, the design of which is to show how and why all the civilized countries of the world fell under the dominion of Rome. He died about 125 B. C.

Polycarp (*pŏl'i-kärp*), one of the early Christian fathers, was born about 69 A. D., probably of Christian parents. Polycarp's life is a very important one from the fact that he bridges the period between the age of the original apostles and that of his own disciple Irenæus. Whether he was actually appointed bishop at Smyrna by the Apostle John may well be doubted, but he certainly occupied a prominent position in the church from his earliest manhood. This is the tribute that Irenæus pays to his memory: "I can tell the very place where the blessed Polycarp used to sit and discourse. . . . Whatsoever things he had heard from John and others about the Lord he would relate as having received them from eyewitnesses." Toward the close of his life Polycarp visited Rome, and on his return to Smyrna became the victim of a persecution of the Christians. Being offered his life by the proconsul if he would renounce Christ, he answered: "Eighty and six years have I served Him, and He has done me only good. Why should I deny Him now?" The games being over, death by fire was substituted for death by wild beasts, the mob eagerly gathering fuel for the flames (A. D. 155). The only writing left by Polycarp is an epistle to the Philippians, the authenticity of which, though seriously questioned, may be considered as clearly established.

Polycrates (*po-lĭk'ra-tēz*), tyrant of Samos from 536 to 522 B. C. After conquering several islands of the archipelago and even some towns on the Asiatic mainland, he waged a successful war against the inhabitants of Miletus and defeated their allies, the Thesbians, in a great sea-fight. His alliance with Amasis, king of Egypt, proves the importance of this insular prince in the eyes even of great monarchs. Amasis broke off the alliance, and when Cambyses the Persian invaded Egypt in 525 B. C., Polycrates sent forty ships in which he placed all the Samians who were hostile to his government, hoping that they would never return. But they soon mutinied against the Persian authority, and sailed back to Samos for the purpose of overthrowing Polycrates. Failing in this effort, they proceeded to Sparta and formed an alliance with the Spartans and the Corinthians. A triple force of Samians, Spartans and Corinthians besieged Samos in vain, and Polycrates became more firmly established in his authority than ever. But evil fortune overtook him at last. His deadly enemy, Orœtes, satrap of Sardis, enticed him to visit Magnesia, where he was seized and crucified.

Polyembryony (*pŏl'ĭ-ĕm'brĭ-ō-nȳ*) (in plants), a name applied to any case in which more than one embryo occurs in a seed. This is a thing of rare occurrence, although quite a number of embryos start in the seeds of gymnosperms. As a rule, when several embryos begin, one of them sooner or later develops at the expense of the others, which gradually disappear. Now and then, however, more than one embryo is found both in gymnosperms and angiosperms, the extra embryo having arisen either from an extra fertilized egg, as is probably true in the gymnosperms, or as the budding outgrowth from some part outside of the egg, often the case in orange seeds

Polynesia (*pŏl'ĭ-nē'shĭ-ă*), (from Greek *polys* for many and *nesos* for island), a term applied to the islands of the Pacific Ocean east of the Philippines, New Guinea and Australia, except Japan, the Kuriles, Aleutians, Queen Charlotte, Vancouver, Revillagigedo and Galapagos, which are geographical dependencies of the adjoining Asiatic and American continents. These Polynesian islands — also called South Sea islands — are distributed over a vast area, nearly 11,000,000 square miles, but the extent of dry land is less than 200,000 square miles; while the population probably is less than 1,500,000. Polynesia comprises the three broad divisions of Micronesia, Melanesia and East Polynesia, and each is subdivided into several secondary groups. Micronesia lies on the extreme northwest, almost entirely north of the equator, and consists almost exclusively of small volcanoes and atolls, forming the five archipelagoes of Pelew, the Marianas, the Carolines, Marshall and Gilbert. The area of the islands in Micronesia is only a little over 1,000 square miles; the population is estimated at about 100,000. Melanesia lies in the extreme west, south of the equator, and consists mainly of coral and volcanic islands, disposed in parallel lines from northwest to southeast, forming the eleven archipelagoes of the Admiralty, Bismarck, D'Entrecasteaux, Louisiade, Solomon, Santa Cruz, Banks, New Hebrides, New Caledonia, Loyalty and Fiji, all inhabited by the Melanesian or dark-brown, oceanic race. The land-area of Melanesia is estimated at about 65,000 square miles and the population at about 410,000. East Polynesia, the third and largest division, lies on both sides of the equator, and consists of the twelve archipelagoes of Hawaii, Phœnix, Ellice, Tokelau, Samoa, Tonga, Kermadec, Austral, Cook (Hervey), Tahiti (Society), Tuamotu (Low), Marquesas and New Zealand, besides numerous islets, as Norfolk, Chatham, Easter and others. This division is the special domain of the brown race, commonly called Polynesians in a special sense. Although the Polynesian islands are spread over so large an area, there is great uniformity of climate among them, except in New Zealand. The mean temperature is about 70°, both in Hawaii and New Caledonia (about the two tropics), with an extreme range from 50° to 90°. For more than a century the oceanic peoples have been in contact with Europeans and Americans, and many of the Polynesians, as well as many of the Melanesians, profess some form of Christianity, the first mission being that to Tahiti in 1797 by the London Missionary Society. But this contact appears to have caused a remarkable decrease of the population. The population of Hawaii has fallen from 300,000 in 1797 to 29,787 (the part-Hawaiians numbering 7,843), and a similar falling off has occurred in other islands. Everywhere the pure Polynesian race seems to disappear. This result is due in part to the introduction of alcoholic drinks, in part to the changes of habits, dress etc. introduced by the missionaries, but mainly to the ravages of disease. See Fornander's *Account of the Polynesian Race*. See, also, such articles as Aleutian Islands, Van Diemen's Land and other articles in alphabetical arrangement.

Polyp (*pŏl′ĭp*), the individual feeding-animal in a colony of hydroids. The body is tubular, surmounted by a disc which is surrounded by tentacles. The disc is also perforated in the center by a mouth. The fresh-water hydra is an example of a single polyp. The name also applies to individual coral animals. See Hydra and Hydrozoa.

Polypetalous (*pŏl′ĭ-pĕt′ al-ŭs*) **Flowers,** those in which the individual petals are separate and distinct. The contrasting term is sympetalous (which see). Polypetalous flowers are thought to be more primitive than those which are sympetalous. Common illustrations are the buttercups, roses etc.

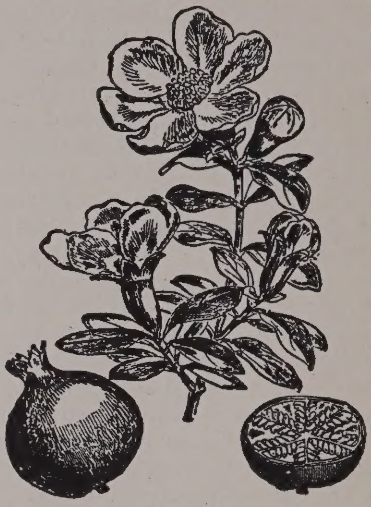
Polyphemus (*pŏl′ĭ-fē′mŭs*), in classical mythology, the son of Poseidon and the nymph Thoösa. He was a shepherd of immense size, and had only one eye in the center of his forehead. When Ulysses landed on Sicily, he and his companions were seized by Polyphemus and confined in a cave. After the huge cannibal had eaten six of his twelve companions, Ulysses (*q. v.*) intoxicated him and put out his eye with a burning pole, thereby escaping from the cave.

Pol′ytech′nic Schools, also called schools of technology or technical institutes, appear to lie between industrial schools (*q. v.*) and the professional schools of universities. They devote comparatively little time to the humanities, but much to modern languages, mathematics and science, as well as engineering and other semiindustrial, semiprofessional branches. The first school of the kind was established at Paris in 1794, under the name of the School of Public Works. This Polytechnic School, as it is now called, is the school in which France trains artillery officers and engineers, directors of roads and bridges, telegraph officers and, in fact, all officials who need to know something of the higher branches of technical science. In London the Polytechnics at Regent St., Langham Place, Balderton St. and Oxford St. are aided by the County Council. London also has a City Polytechnic with branches at Birkbeck College, Chancery Lane, and the City of London College at Moorfields. The Regent Street Polytechnic offers courses which may be regarded as representative of schools of technology, *e. g.*, in art, book-keeping, business training, chemistry, civil service, cookery, dresscutting, elocution, first aid to the injured, harmony, Italian, landsurveying, the mandolin and guitar, metal-plate work, millinery, photography, the piano, physical culture, physiology and hygiene, the poetry of Robert Browning, shorthand and typewriting, solo singing, theory of music, the violin etc. The Northampton Institute is more nearly professional and more strictly technological in character. It has departments devoted to mechanical engineering and metal trades, artistic crafts, electrical engineering and applied physics, technical optics, technical chemistry, horology, domestic economy and miscellaneous trades. This curriculum suggests what may be the most proper function of polytechnics: instruction in the more complex branches of modern industry. In America the oldest institution of the kind is Rensselaer Polytechnic Institute at Troy, New York, founded in 1824. Franklin Institute, founded at Philadelphia in the same year, also partook in a measure of the nature of a polytechnic. But it was only after the Civil War that polytechnic schools really became an important factor in industrial progress both directly and through their influence upon collegiate education. In 1865 was opened the Massachusetts Institute of Technology, in 1868 the Worcester Polytechnic Institute, in 1866 Lehigh University and in 1871 Stevens Institute of Technology. Moreover, since the land-grant act of 1862, about 60 colleges of agriculture and mechanic arts have received a generous endowment. Probably the best equipped polytechnic school at present in the United States, although it does not employ the name, is the New York Trade-School founded in 1881 by the late Colonel R. T. Auchmuty. It, perhaps, is an open question whether polytechnics which attempt to teach a great number of arts are as efficient as schools devoted to a single art or to few arts. In Germany a single specialty is taught in a *Fachschule*. The textile schools illustrate the efficiency of this plan in America. With the best American polytechnics may perhaps be classed such institutions as the Williamson and the San Francisco Trade-School, Drexel and Pratt Institutes and the New York Institute for Artist-Artisans, in addition to others already mentioned.

Pombal (*pŏm-bäl′*), **Sebastian Joseph de Carvalho e Mello,** Marquis of, the greatest of Portuguese statesmen, was born on May 13, 1699, at the castle of Soure, near Coimbra. In 1739 he was appointed ambassador to London, and six years later was sent to Vienna in a similar capacity. Just before Joseph I ascended the throne, Pombal was made secretary for foreign affairs, and after the great earthquake at Lisbon in 1755 he displayed such wisdom and ability that in the next year the king appointed him prime minister. After subduing a revolt and conspiracy against the life of the king, he abolished slavery in Portugal (*q. v.*), sought to establish good elementary schools and published a new code of laws. In addition to this he reorganized the army and established a Portuguese East India Company. The tyranny of the Inquisition was also broken, besides numerous other reforms. On the accession of Maria I in 1777, who was under clerical influence, Pombal was deprived of office and banished from court, while many of his institutions were abolished. He died at his castle of Pombal, May 8, 1782. The peasantry always speak of him as The Great Marquis.

Pome (*pōm*), a fruit, as the apple, pear, quince, in which the fleshy part is developed by a flower-structure outside of the pistils. This structure is commonly referred to as the calyx, but it really is the cup-like outgrowth from which sepals, petals and stamens arise. See FRUIT.

Pomegranate (*pŭm′grăn′ăt*), the fruit of *Punica granatum*, a tree belonging to the order of *Lythraceæ*. It is a native of Asia, and is very commonly cultivated throughout the tropics and semitropics. It rises 15 or 20 feet, and has numerous slender branches, some of which are armed with thorns. The fruit is globular, about as large as a small apple, but with a leathery rind, of a deep golden color tinged with red, and contains numerous seeds coated with juicy, edible pulp.


POMEGRANATE

Pomerania (*pŏm′ē-rā′nĭ-a*) or **Pomm′ern,** a province of Prussia, bounded on the north by the Baltic Sea, on the east by western Prussia, on the south by Brandenburg and on the west by Mecklenburg. It is one of the lowest regions in Germany, and contains but few hills of even moderate height, but numerous lakes and ponds. The Oder divides Hither Pomerania (next Mecklenburg) from Farther Pomerania, the shore of the latter being lined with dunes. The larger portion of Pomerania is under tillage, the agricultural products being varied and numerous. To-day its area is 11,631 square miles, with a population of 1,716,481 Pomerania formed part of the territory of the ancient Vandals. When they moved south in the 5th century, it was occupied by Slavic tribes, one of which was called Pomerani. Hence the name of the region. The native princes assumed the title of duke in 1170, and joined the Holy Roman empire. The duchy was overrun by the imperialists in the Thirty Years' War, and they were followed by the Swedes, who established themselves in Hither Pomerania and some towns of Farther Pomerania. Not until 1815 was the last Swedish possession surrendered to Prussia. The capital is Stettin, population 236,145.

Pomona (*pô-mō'nȧ*), the Roman goddess of fruits and flowers. She was greatly beloved by a number of the rustic divinities, among whom were Sylvanus, Picus and Vertumnus. Propertius tells us that the last named, after vainly trying to approach her under various forms, at last succeeded by assuming the guise of an old woman; and, having awakened her feelings of pity, suddenly transformed himself into a blooming youth. In works of art Pomona is generally represented with fruits in her lap or in a basket and with a garland of fruits in her hair and a pruning-knife in her right hand.

Pompadour (*pôn'pȧ'dōōr'*), **Jeanne Antoinette Poisson,** Marquise de, the most famous among the mistresses of Louis XV, was born at Paris, Dec. 29, 1721. She possessed remarkable grace and beauty, and charmed every one with her wit and vivacity. In 1741 she married Le Normant d'Étioles, and soon became a queen of fashion in Paris. But this did not satisfy her, as her heart was set on becoming the king's favorite. At length she attracted his attention at a ball, and ere long she was established at Versailles with the title of Marquise de Pompadour. For twenty years she was almost the absolute ruler of France, the king being merely a spectator of his reign without even taking interest in it. She filled all public offices with her favorites, and made her own creatures ministers of France. Although her policy was disastrous and her wars unfortunate, she retained her position to the end by relieving the king of all business, by diverting him with private theatricals and even by consenting to his vices and immoralities. At last her nerves gave way under the strain and excitement to which she was subject, and after a sickness of twenty days she died on April 15, 1764.

Pompeii (*pŏm-pā'yê*), an ancient Italian city, near the mouth of Sarnus River and at the foot of Mt. Vesuvius, 13 miles southeast of Naples. It was founded by the Oscans about 600 B. C., and was afterwards occupied by the Etruscans and Samnites, the latter being dispossessed by the Romans about 100 B. C. From that time until its destruction in 79 A. D. it was a resort, frequented by the Roman aristocracy. In 63 its magnificent buildings were nearly all leveled to the ground by an earthquake, and some years elapsed before the citizens could be induced to return and rebuild them. Before this work was fully completed, Mt. Vesuvius (*q. v.*), whose volcanic fires had been slumbering for unknown ages, burst forth in a violent eruption, which buried Pompeii and Herculaneum under dense beds of cinders and ashes. Amid the deep gloom that covered land and sea the panic of the citizens was aggravated by repeated shocks of earthquake, and for three days the flight continued till Pompeii was abandoned by all who could effect their escape. By the fourth day the sun again became dimly visible, and the more courageous of the citizens began to return for such portions of their property as they could rescue from the ruins. The desolation and distress were so great that Emperor Titus organized relief on a grand scale, and even undertook to clear and rebuild the city. This attempt, however, was soon abandoned; and the unfortunate city remained a heap of hardened earth and ashes until its very site was forgotten, and even the celebrated topographer Cluverius was unable to fix it with certainty. This difficulty arose in large measure from the fact that the convulsions attending the eruption had turned the Sarnus from its regular course, and so raised the sea-beach that the ruins are nearly a mile from the coast. It was not until 1748 that an accidental discovery revealed that beneath the vineyards and mulberry grounds which covered the site lay the ruins of a city far more accessible, if not more interesting, than the previously discovered Herculaneum. Excavation proceeded fitfully until 1860, when the Italian government commenced unearthing the city in a systematic and scientific manner.

The general plan of the town is very regular, the streets being straight and crossing each other at right angles or nearly so. The streets rarely exceed 20 feet in width, the broadest yet found being less than 30 feet, while the back streets running parallel to the main lines are only about 15 feet. They are usually paved with blocks of lava fitted very closely together, and the marks of horses' hoofs and the ruts of chariot wheels are still plainly visible. The houses are generally low, rarely exceeding two stories in height. Not more than 300 skeletons have been discovered, chiefly in cellars and underground apartments. This fact makes it probable that most of the inhabitants escaped. The population probably was 12,000. See E. Neville Rolfe's *Pompeii Past and Present.*

Pom'pey the Great was born in 106 B. C., and at 17 fought with his father in the Civil War between Marius and Sulla on the side of the latter. When Sulla returned from Greece to Italy to oppose Marius, Pompey hastened into Picenum and raised three legions. With these he drove the soldiers of Marius out of the district, and joined Sulla. Soon after this he was sent to destroy the remains of the Marian or democratic faction in Africa and Sicily; and on his return to Rome was granted a triumph and honored with the title of *Magnus* or The Great. His next exploits were driving Lepidus out of Italy and fighting brave Sertorius in Spain. Pompey suffered a number of defeats, but was able to bring the conflict to a successful issue after the assassination of Sertorius. On his way back to Rome he routed the remnant of the forces of Spartacus, and closed the Servile War. For this service he was awarded a triumph, while Crassus, who had defeated the main body of the forces of Spartacus, received only an ovation. Pompey was now the idol of the people, and, though legally ineligible to the consulship, he was chosen to that position, the senate removing his disabilities by a special act In 67–66 B. C. Pompey distinguished himself by clearing the Mediterranean of the pirates who had so long infested it; and during the next four years he conquered Mithradates, king of Pontus; Tigranes, king of Armenia; and Antiochus, king of Syria. On his return to Italy he disbanded his army, and in 61 B. C. entered Rome in triumph for the third time. Pompey now sought to have his acts in Asia ratified by the senate and certain lands divided among his veterans; and on that body refusing to accede to his wishes, he, in connection with Crassus, formed the alliance with Julius Cæsar that is known as the first triumvirate. For a time they carried everything before them, and the political alliance was made closer and stronger by the marriage of Pompey and Cæsar's daughter Julia. In 58 Cæsar (*q. v.*) led his army into Gaul, and for nine years Pompey idly wasted time and energies at Rome. Jealousies arose between the two; and after Julia's death in 54 Pompey returned to the aristocratic party which desired to check Cæsar's progress and, if possible, to strip him of his command. Civil war ensued, that ended with the battle of Pharsalia in 48 B. C., in which Cæsar was completely victorious over Pompey. Pompey fled to Egypt, and was treacherously murdered while landing. But Cæsar was so sincerely grieved that he caused the murderers to be put to death.

Pompey's Pillar, a celebrated Corinthian column standing near Alexandria in Egypt, on an eminence south of the walls. Its total height is 98 feet 9 inches, the height of the shaft being a little over 70 feet. The Greek inscription on the base shows that it was erected in 302 A. D. by Publius, prefect of Egypt, in honor of Emperor Diocletian; and it is supposed to record the conquest of Alexandria by Diocletian in 296 A .D.

Pon'ce is an important city in Porto Rico, the capital of the province of Ponce. It is the second largest city on the island and the first in commercial importance. It is well-built and modern in appearance, with macadamized streets, public plazas, churches, hospitals, theaters, an asylum, municipal hall and a number of handsome residences. It also has a public library and a good school-system established since the American occupation, in connection with which is conducted an industrial school with about 300 students. The water-supply is excellent, brought by an aqueduct three miles long. It has electric-light works and a street-car system which connects with Playa de Ponce, the port. The custom-house and the chief commercial houses are here. The harbor is large, is accessible to vessels drawing 25 feet, and is provided with wharves. The inhabitants engage chiefly in commercial and mercantile pursuits, but there are a few mechanical industries. The population in 1910 was 27,952 and that of the municipal district 55,477.

Ponce de Leon (*pôn'thâ dâ lâ-ôn'*), **Juan,** the discoverer of Florida, was born at San Servas, Spain, in 1460; was a court page; served against the Moors; and in 1502 sailed with Ovando to Hispaniola and became governor of the eastern part of the island. In 1510 he obtained the government of Porto Rico, and had conquered the whole island by 1512 when deprived of his post. He then, broken in health, set out in quest of the fountain of perpetual youth, and on the 27th of March, 1512, found Florida, landing a little north of where St. Augustine stands. He secured the appointment of governor of the country, and attempted to conquer his new subjects, but failed and lost nearly all his followers. He died in Cuba in July of 1521.

Pon'cho, an important article of male attire in Chile, the Argentine Republic and other parts of South America. It consists of a piece of woolen or alpaca cloth, six or seven feet long and three or four broad, with a slit of a foot or more in the middle through which the wearer passes his head, so that the poncho covers the shoulders and hangs down before and behind. Waterproof ponchos are worn by soldiers to a great extent, especially by cavalrymen.

Pon'doland, lying along the southeastern coast of South Africa, has been a part of Cape Colony since Sept. 25, 1894. It has an area of 3,918 square miles and a population in April, 1904, of 1,113 whites and 201,644 blacks, a total of 202,757.

Pontiac (*pŏn'tĭ-ăk*), chief of the Ottawa Indians, was born about 1712. In 1746 he defended Detroit, then a French settlement, against the attacks of hostile tribes, and he is also said to have led his warriors at Braddock's defeat in 1755. After the French had surrendered Canada, his hatred of the English prompted him to organize a combined attack upon all the English garrisons and settlements with a view to the extermination of what he called "those dogs dressed in red." The 7th of May, 1763, was selected as the day for the attack, which in most places was successful; but at Detroit, where Pontiac commanded in person, the commander was forewarned, and a five months' siege ensued. Pontiac resorted to every means familiar to savages to reduce the place, but was unsuccessful. Peace was finally made in 1766, Pontiac being forced to submit to British rule. He was killed at Cahokia, Ill., by a drunken Indian in 1769.

Pon'tifex, the title borne by the members of one of the great religious colleges among the ancient Romans, the other being the college of Augurs. Although it is customary to speak of the college of pontiffs as a priesthood, it was not such, strictly speaking; that is, the members were not charged with the worship of any particular divinity nor did they conduct sacrifices. The duties of the pontiffs embraced the regulation of all religious rites and ceremonies of the state — how the gods should be worshiped, how burials should be conducted, how the *manes* (departed spirits) of the head should be appeased. In matters of religion their authority was supreme; there was no appeal from their decisions; and they themselves were responsible neither to senate nor to people. Their president was termed *pontifex maximus.* Their number, including the *pontifex maximus*, was originally five, all of whom were taken from the patricians. In 300 B. C. the Ogulnian law raised the number to nine, four of whom were to be plebeians. The first plebeian, however, who attained the dignity was Tiberius Coruncanius in 254 B. C. Sulla in 81 B. C. increased the number to 15, and Julius Cæsar to 16, he himself filling the position. During the empire the emperors generally discharged the functions of the position, but after the establishment of Christianity the title was assumed by the bishops of Rome, and the term pontiff is now one of the designations of the pope. The original Latin means the greatest or chief bridge-builder.

Pontine (*pŏn'tĭn*) **Marshes,** a low district forming the southern part of the Campagna of Rome and extending from Velletri southeast to the sea at Terracina. The length of the plain is about 28 miles, the breadth varying from 4 to 12 miles. The Appian Way was projected through this district in 312 B. C., and various plans were tried by the ancient Romans for draining the marshes, but with poor success. By the expenditure of some $2,000,000 Pope Pius VI during 1777-96 brought the Pontine marshes to their present state, in which a portion of the land is brought under cultivation, and other portions furnish pasture for horses, cattle and other animals. In 1899 the Italian government granted about 1½ million dollars for further drainage of the district.

Pontoon' (from *pons*, Latin for a bridge), boats connected together and stretched across a lake or stream to furnish a temporary bridge for the passage of an army. From the earliest times pontoon bridges have been used in crossing streams; and a pontoon train has become a necessity for every army manœuvering in a country where there are rivers too deep to be forded, many important campaigns having failed from lack of pontoons.

Pon'tus, the name given by the ancient Greeks to a country in the northeast of Asia Minor, bordering on the *Pontus Euxinus* (whence its name) and extending from Halys River in the west to the frontiers of Colchis and Armenia in the east. The name seems to have come into use after the era of Alexander the Great. See MITHRADATES.

Poo'na, a town in British India, situated on the Muta, 120 miles southeast of Bombay. Although the place abounds in beautiful gardens, the streets are mostly crooked and narrow and the houses poor. The city was the capital of the Mahratta princes, but was annexed by the British in 1817. Here have been built Decca College and the college of science, a normal school, a high school, and other educational establishments. Population with suburbs 171,000

Poor-Laws. The obligation of providing for the poor has been recognized by all civilized nations. Among the primitive peoples of the earth the giving of alms to those who were in need was inculcated as a religious observance, and ancient European nations regarded a provision for the poor as a matter of state policy. In early times Athens could boast of having no citizen in want, "nor did any disgrace the nation by begging." But war at length brought poverty, and the state decreed the maintenance of those who were wounded in battle and afterward of the widows and children of those who fell. There also were societies for the relief of distress among some of the Grecian states. Among the Romans the distribution of grain was introduced by Gaius Gracchus, and continued till the fall of the empire. In the time of Augustus 200,000 people were thus fed. Cicero mentions this provision of the Roman law as one in high favor with the people, since it furnished them abundant subsistence without labor; other Roman writers describe its results as injurious, creating a nation of idlers and mendicants and leaving the soil uncultivated.

In the middle ages the great body of the laboring classes were in a condition of serfdom, and looked to their feudal lords for support. But the church constituted herself the great receiver and dispenser of alms. The rich monasteries and abbeys distributed doles to the poor, as is still done at the mosque under the Mohammedan system. In most states of continental Europe the church remains to a greater or lesser extent the source of relief to the poor, the state only stepping in when the contributions of the church and of private charity are insufficient. In England the statute of 1388 is the first that makes provision for the impotent poor. Various statutes were passed after that time, culminating in the statute of

1601, which has formed the basis of the poor-law system of England to the present time. It taxed every inhabitant of every parish for the relief of the poor and directed the justices in every county to appoint three or four substantial householders in each parish to be overseers of the poor in connection with the churchwardens.

Various efforts were made to remedy abuses which arose under this system, of which the workhouse-system was one of the earliest. All who refused to be lodged in the workhouse were refused relief. But the act of 1796 repealed the workhouse test and allowed relief to be given in aid of wages, so that the poor-laws were practically turned into a mode of paying wages. Various changes were made from time to time, and finally in 1871 the poor-law board was abolished and its powers transferred to the local government-board. The fundamental rule in England and Wales is that each parish is bound to maintain its own poor, and this is done by a poor-rate which churchwardens and overseers may levy on all persons occupying land in the parish. In 1906 the poor-rates raised for the year, under the local-government act of 1894, amounted to £16,741,663.

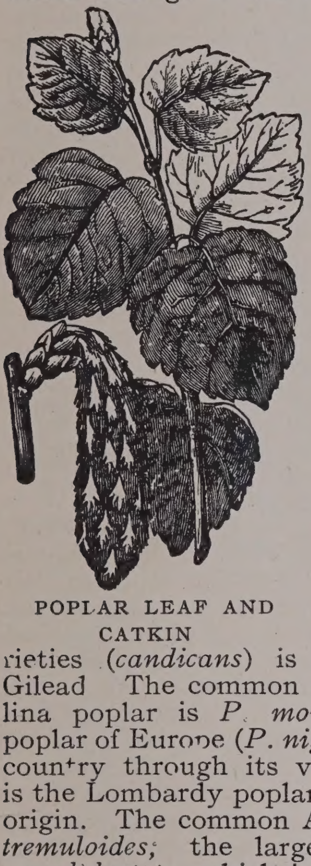
In the United States a system of relief somewhat similar to that of England prevails in most of the states. Poor-houses are established by the county, to which persons unable to support themselves are transferred and cared for, such work as they are able to do being provided for them. In some states provision has been made for children's homes, where all children under a certain age, whose parents are dead or unable to provide for them, are fed, clothed and educated. Happily thus far the number of dependent persons in America is so small that the tax for their support is not seriously felt.

Poore, Benjamin Perley, an American journalist, was born at Newburyport, Mass., Nov. 2, 1820. He was apprenticed to a printer when a boy and grew up in a newspaper office. From 1838 to 1840 he edited *The Southern Whig* at Atlanta, Ga. He was sent with the embassy to Belgium in 1841 as an attaché, and remained in Europe seven years. While abroad, he collected valuable data for the archives of Massachusetts. He became editor of *The Congressional Directory* in 1867. He published a number of works, among which those most largely sold were the *Life of Zachary Taylor*, the *Conspiracy Trial for the Murder of Abraham Lincoln* and *Sixty Years at the Federal Metropolis*. He died at Washington, D. C., May 30, 1887.

Pope, a title first given to all bishops of the Christian church, but now exclusively applied to the bishop of Rome or head of the Roman Catholic church. Tradition, confirmed by the faith of the church, represents St. Peter as the first bishop of Rome Whether he were such or not, it was natural that the early bishops residing in the imperial city should acquire a large measure of influence and importance and that after the empire became Christian they should attain considerable temporal power. The temporal power was not fully established, however, until 754, under Pepin, king of the Franks. From that time the history of the papacy has been a contest of greater or lesser intensity with the princes and rulers of Europe, in which now one and now the other of the contending parties prevailed. At present the pope is stripped of all temporal power, but his authority over the church in all matters spiritual and ecclesiastical is supreme and unquestioned, the Vatican Council which assembled at Rome in 1870 having proclaimed his infallibility on all questions of faith and morals. Whenever a vacancy occurs in the papal chair, it is filled by the cardinals choosing one of their number to occupy the place. A history of the more important popes will be found under their several titles.

Pope, Alexander, English poet, was born at London, May 21, 1688, his father being a Roman Catholic and a man of means. Although Pope's early education was irregular and unsystematic, his father retiring from business soon after the son's birth, his application to study must have been close, for even in his juvenile poems are traces of profound thought. In 1711 Pope published his *Essay on Criticism*, which placed him at once in the front rank of the literary men of his day; and in 1712 appeared the *Rape of the Lock*, the most imaginative of his poems. Soon after appeared his translation of Homer's *Iliad*, which brought a fortune of $30,000. (See HOMER). A translation of the *Odyssey* followed a few years later, and in 1728 he issued the third volume of *The Dunciad*. The *Essay on Man*, published in 1734, is a didactic poem, and, although almost wholly deficient in the imaginative quality, is a masterpiece of wit and versification. Pope's command of terse and smooth expression is at its highest here; and it has been well said that this poem contains more familiar quotations than any other poem of equal length in the English language. Pope died at Twickenham, near London, May 30, 1744, leaving behind him a literary fame that has suffered no eclipse in over a century and a half.

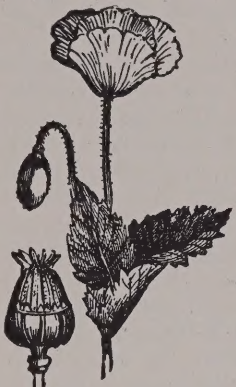
Pope, John, an American general, was born at Louisville, Ky., March 16, 1822, and graduated at West Point in 1842, after which he entered the engineer-corps of the United States army. He served in the Florida War of 1842-44 and in the Mexican War, winning the rank of captain for his conduct at Monterey and Buena Vista. At the outbreak of the Civil War he was appointed brigadier-general of volunteers, and in the spring of 1862 distinguished himself by the capture of New Madrid, Mo., and Island No. 10 in the Mississippi. On account of these successes he was transferred to the east and placed in command of the forces formerly under Generals Fremont, McDowell and Banks, each of whom had been outgeneraled and beaten by "Stonewall" Jackson. He was defeated at the second battle of Bull Run, Aug. 29–30, 1862. He then requested to be relieved, and was transferred to the department of the northwest. Pope attributed his defeat to Gen. Fitz-John Porter (*q. v.*). In 1882 Pope was made a major-general in the regular army, and retired in 1886. He died while on a visit to the Soldiers' and Sailors' Home at Sandusky, O., Sept. 23, 1892.


POPLAR LEAF AND CATKIN

Pop′lar, a species of the genus *Populus*, which belongs to the willow family. Characteristics are fluttering, shimmering leaves, whitish trunk, drooping catkins, cottony seeds. There are about 25 species native to the northern hemisphere, about half belonging to North America. The poplars may be divided in general into two groups: the balsam poplars with sticky buds and white poplars or aspens with buds not sticky. The common balsam poplar is *P. balsamifera*, sometimes also called tacaamhac. One of its varieties (*candicans*) is known as balm of Gilead The common cottonwood or Carolina poplar is *P. monilifera*. The black poplar of Europe (*P. nigra*) is familiar in this country through its variety *italica*, which is the Lombardy poplar, probably of Asiatic origin. The common American aspen is *P. tremuloides;* the larger species being *P. grandidentata*, which is in cultivation in its "weeping" forms. A very commonly planted wild poplar is the abele of Europe, *P. alba*, which has leaves white cottony beneath. The name of poplar or white poplar has also been wrongly applied to a tree in a very different group, namely, the great tulip-tree (*Liriodendron*), which is closely related to the magnolias. It is this tulip-tree which yields the so-called poplar lumber of commerce. Of recent years poplar-wood has become valuable for paper-making.

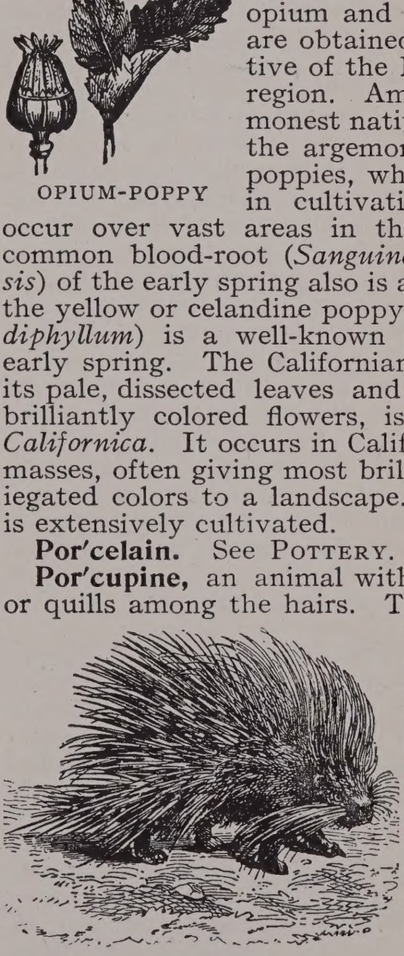
Pop′lin, a fabric of dry goods produced by weaving a weft of worsted yarn into a warp of silk. On account of worsted yarns being thicker than the silk, poplins always have a corded appearance. They may be either plain or figured, and used for dress goods, and for fine upholstery. The manufacture of poplin goods is of French origin, and was introduced into England and Ireland by Protestant refugees during the 17th century.

Popocatepetl (*pô-pō-kȧ-tā-pĕt′l*), a volcano about 40 miles southeast of the City of Mexico. It rises in the form of a cone about 17,000 feet above the level of the sea. Although smoke issues, no eruption has taken place since 1540. It is frequently scaled, and in its crater (nearly a mile in diameter and about 1,000 feet deep) much sulphur is found.


OPIUM-POPPY

Pop′py, species of the poppy family (*Papaveraceæ*), but in the narrowest sense the name belongs to the genus *Papaver*, to which the opium-poppy (*P. somniferum*) of the Old World belongs. This poppy is largely cultivated in Europe and Asia for its capsule, from which the drug opium and the poppy-oil are obtained. It is a native of the Mediterranean region. Among the commonest native poppies are the argemones or prickly poppies, which are found in cultivation, and also occur over vast areas in the west. The common blood-root (*Sanguinaria Canadensis*) of the early spring also is a poppy, while the yellow or celandine poppy (*Stylophorum diphyllum*) is a well-known poppy of the early spring. The Californian poppy, with its pale, dissected leaves and long-stalked, brilliantly colored flowers, is *Eschscholtzia Californica*. It occurs in California in great masses, often giving most brilliant and variegated colors to a landscape. This poppy is extensively cultivated.

Por′celain. See POTTERY.

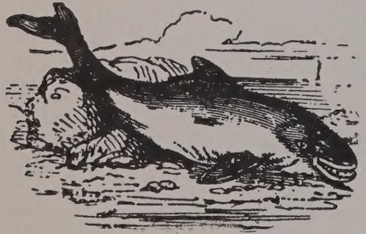

PORCUPINE

Por′cupine, an animal with sharp spines or quills among the hairs. The Old-World porcupines are ground animals and live in burrows; those of the New World are mainly tree animals. They belong to the rodents or gnawing animals, feed upon bark of trees, and are often found around camps, attracted by salt and greasy leather or wood. The flesh is eaten by the Indians. The common Canadian porcupine has a stout body, about forty inches long, with a short tail. The hair is dark brown, and the spines are from four to six inches long. They are almost hidden in the hair. It is found in New England, New York, Pennsylvania, Ohio and northward and northwestward. It should never be called hedgehog, for the latter is not a gnawing animal but an insect-eater, smaller, weaker and not found in America. Porcupines are slow-moving and slow-witted creatures. The idea that they can shoot their quills is a mistaken one, but when attacked they strike with the tail, and quills are thus driven into the disturber. When alarmed, the quills are raised erect, the animal presenting its bristling appearance. The tree-porcupine of tropical South America and Mexico is of slighter build, and has a tail capable of grasping.

Poros'ity, a term by which we express the fact that no body of matter, whether solid or liquid, completely fills the space it occupies, as the particles or molecules of all bodies have spaces between them filled with air, and these spaces are called *pores.* Many objects, as wood and cloth, show their porosity by the readiness with which they absorb water or any other liquid. Under heavy pressure water has been forced through iron, silver and other metals; and the porosity of water itself has been proven by mixing it with alcohol and noting the fact that the bulk of the mixture is much less than the sum of the two bulks before the mixture.

Porphyry (*pôr'fĭ-rȳ*), igneous rocks made of large and distinct crystals imbedded in a matrix of small and often indistinct crystals. The term also is sometimes applied to lavas, the matrix of which is but partly crystalline. The name, therefore, refers to the structure of the rock, not to its composition. A granite would be called porphyritic if some of its crystals, for example some of its feldspar crystals, were conspicuously larger than others. A quartz porphyry is one in which the conspicuous crystals (phenocrysts) are all quartz. Light-colored igneous rocks are more commonly porphyritic than dark ones.

Porpoise (*pôr'pŭs*), a sea-mammal belonging to the group of toothed whales. They are similar in general appearance to dolphins, but have a shorter snout. They are dark above and whitish below. Porpoises are common in the North Atlantic near shore, and often ascend rivers. They feed on such fish as mackerel and herring, for the capture of which their teeth are well-adapted. The bay-porpoise of the Pacific coast is the smallest of the whale family, being often not more than four or five feet long. Some other species reach a length of about nine feet. Their very thick hide is beaten down and made into soft leather. Their fat yields oil of fine quality.


PORPOISE

Port Ar'thur, called by the Chinese Lu-shun-k'ow, is a naval station on the northern coast of China, in the province of Shing-king, about 275 miles east of Peking. Up to 1881 it was merely a harbor of refuge for coastwise sailing vessels; but in that year China determined to make it a naval port for her northern squadron. It is entirely surrounded by hills; and at great expense it was fitted with dry docks, foundries for casting heavy ordnance and everything needful to constitute an important station. It grew from a mere handful of mud huts in 1881 to a place of 6,000 inhabitants in 1893. In 1894 it was destroyed by the Japanese as a result of the war with China. In 1898 Russia obtained a lease of this harbor for twenty-five years, subject to renewal; and with it was obtained possession of the adjacent seas and all the Chinese territory to the north. Port Arthur, though small, is naturally impregnable; and its many fortifications were made still more formidable by the Russian authorities. The acquisition of Port Arthur by Russia led to the occupation of Wei-Hai-Wei by Great Britain. In 1905 Japan captured Port Arthur from Russia after a long and terrible siege, and China, after the conclusion of peace between Japan and Russia, ceded Port Arthur to Japan. See CHINESE EMPIRE, JAPAN and RUSSIA.

Port Arthur, Can., a city on the western shore of Thunder Bay, in Lake Superior, Ontario. It is a divisional point on the Canadian Northern Railway and is the main line of the Canadian Pacific. It and Fort William (*q. v.*), twin cities almost joining, are at the head of lake-navigation. It, therefore, is a point of transhipment for much of the merchandise consigned by merchants east to the settlers on the western plains and for the grain from Canada's western wheat-belt, which is transhipped to the lake-vessels. The prosperous future of the west is assured, and therefore the location must bring prosperity to these twin cities. The elevators at Port Arthur will handle 9,000,000 bushels of grain. It is the terminus of the Northern Navigation Co., the Booth and White line and the Montreal and Lake Superior Steamships. Port Arthur has an extensive blast-furnace and immense docks; falls in its immediate vicinity can supply 150,000 horse-power. Its lumbering interests are very important. Population 12,862.

Port Arthur Ship-Canal, Tex., is an artificial waterway deriving its name from the town on Sabine Lake. This, which is three miles long and ten wide, marks the boundary line of Texas and Louisiana; and narrows into a long channel, 7½ miles from Port Arthur, which is called Sabine Pass. This is 26 to 40 feet in depth and seven miles in length, terminating in the Gulf of Mexico and giving a shore-line of 14 miles for docks on the two sides. The width of the pass varies from one half-mile to a mile. At the outer end is a bar which has been pierced by a channel formed by extending, a mile or more from shore, two jetties of piled stone, which are built by the Federal government and are expected to cost $1,050,000. These jetties narrow the entrance from the Gulf; and the wash of waters, together with the incoming and outgoing tides, has scoured a channel over the bar from 16 to 25 feet deep. The bar has been the refuge of many vessels assailed by storms. The opening of the canal heralded the creation of a new seaport on the Gulf for the largest ocean-vessels, the connection of a land-locked, fresh-water harbor with the terminus of an 800-mile railway-system and the reduction of 500 miles of the distance over which the exports of the southwestern states have been hauled east and west. The work was commenced in 1883, and the canal was formally opened on March 25th, 1899.

Port Dar′win, one of the finest harbors in Australia, is situated on the coast of the northern territory of South Australia, which is nearly 16 times the size of England. Its entrance is two miles wide, and vessels of any tonnage can sail in it with safety. Palmerston, the chief town on its shores, is the land-terminus of the overland telegraph and is the starting-point of a railway to the gold-fields of the interior, 150 miles distant. A telegraph runs from the north to the south of Central Australia, that is, from Port Darwin to Adelaide, the capital, a distance of over 2,000 miles. See AUSTRALIA.

Port Eliz′abeth, a seaport of the Cape of Good Hope, is on the western shore of Algoa Bay, 85 miles by rail from Graham's Town and 350 from Kimberley. Its public buildings are the town-house, the provincial hospital, churches, a college, a library, and a museum. The town was laid out in 1820, and in 1904 the population had grown to 32,959.

Port Hu′ron, Mich., a city, is on St. Clair River, where it issues from Lake Huron. The city has a fine custom-house, beautiful public library, shipyards, dry-docks, grain-elevators and large manufacturing interests, especially in engines and threshers, portable sawmills and corn-huskers. Both the car and locomotive works of the Grand Trunk Railway are in Port Huron and employ a large number of men. A submarine tunnel, the longest in the world, passes under St. Clair River, connecting Port Huron and Sarnia. Population 33,000.

Port Jer′vis, N. Y., village in Orange County. about 85 miles northwest of New York City. It is on Delaware and Neversink Rivers, and is served by three railroads. There are many waterfalls near, which furnish water-power and aid in the manufacturing industries. Chief among these are glove factories, a silk mill, necktie, overall, shirt and saw factories, a plating works, shoe-factory, flour and planing mills, a sash-factory and printing works. The principal buildings are the Y. M. C. A., the two hospitals, Saint Mary's Orphan Asylum, the Port Jervis Board of Trade and the free library. The village has good public and parochial schools, two private schools and a conservatory of music. Attractive scenery and beautiful waterfalls make Port Jervis a popular summer resort. Population 12,000.

Port Lou′is, the capital and principal port of the British colony of Mauritius (*q. v.*) in the Indian Ocean, is situated on the northwestern coast and is inclosed by a circle of lofty hills. It is a coaling-station of the British navy, and has barracks, harbor defenses and military storehouses. Population with suburbs 52,740.

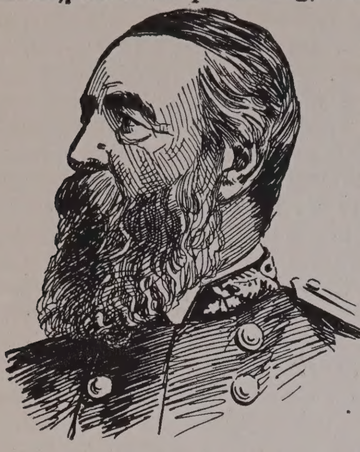
Port Said (*sä-ēd′*), an Egyptian seaport town on the western side of Suez Canal, on a strip of land between Lake Menzaleh and the Mediterranean. The place was named after Said Pasha, the promoter of the canal, and depends wholly on trade, being mainly a coaling-station for steamers. Population 50,179.

Port Simp′son, the most northern port of British Columbia, has a fine harbor, and is one of the Hudson Bay Company's posts.

Portcul′lis, a strong timber or iron grating sliding up and down in the jambs of an entrance to a castle for the purpose of defending it from assailants. The lower ends of the vertical bars had spikes to stick in the ground or to injure those on whom it might fall. A powerful mechanism of windlasses was required to work the portcullis.

Por′ter, David, an American naval officer, was born at Boston, Mass., Feb. 1, 1780. He was appointed a midshipman in the navy in 1798 and lieutenant in the year after. At the beginning of the War of 1812 he was made captain, and captured the first British ship taken in the war. In 1813 with his *Essex* he nearly destroyed the English whale-fishery in the Pacific and took possession of the Marquesas Islands; but in March, 1814, his frigate was destroyed by the British in Valparaiso harbor, and he returned home on parole. In 1824 he commanded an expedition against the pirates in the West Indian waters, and was court-martialed and sussended from duty for six months for compelling the authorities of Porto Rico to apologize for imprisoning some of his officers. Porter was a rear admiral commanding the Mexican navy from 1826 to 1829, when he was appointed American consul general to the Barbary States; he was later transferred to Constantinople where he died, March 3, 1843.

Porter, David Dixon, an American admiral, son of the preceding, was born at Chester, Pa. June 8, 1813. He accompanied his father on his cruise against the West Indian pirates in 1824, and when his father became commander of the Mexican navy, he joined the same service as a midshipman. He entered the United States Navy in 1829, and after being employed on the coast-survey from 1836 to 1841 he became lieutenant, and served till 1845 on the Mediterranean and Brazilian stations, afterward returning to the coast survey. At the commencement of the Civil War he was appointed commander of the *Powhatan* and ordered to Pensacola; but afterward he was placed in command of the mortar-flotilla, with which, under Farragut, he successfully bombarded the forts of New Orleans. In 1863 he was placed in command of the Mississippi gunboats and rendered such signal service in the siege of Vicksburg (*q. v.*) that he was raised to the rank of rear-admiral. Transferred to the North Atlantic squadron, in December of the next year he bombarded and silenced Fort Fisher (*q. v.*), and in January, 1865, the place was captured by the combined action of the military and naval forces. At the close of the war Porter was made vice-admiral, and in 1870 succeeded Farragut as admiral. He died at Washington, D. C., Feb. 13, 1891.



ADMIRAL PORTER

Porter, Fitz-John, an American general, was born at Portsmouth, N. H., Aug. 31, 1822, and graduated at West Point in 1845. During the Mexican War he participated in the siege of Vera Cruz and in the battles of Cerro Gordo and Chapultepec. In the summer of 1861, having been appointed brigadier-general of volunteers, he was placed in command of a division of the army of the Potomac by General McClellan; and in the Virginia peninsular campaign he was placed in command of the 5th army-corps, distinguishing himself in the Seven Days' battles, especially at Malvern Hill. After McClellan's retreat his corps was ordered to re-enforce General Pope (*q. v.*) in his campaign against Lee and Jackson. On the 29th of August Porter received an order a short time before sunset to attack Jackson, which he did not obey. General Pope preferred charges against him, under which he was court-martialed and dismissed from the service. The justice of Porter's sentence was the subject of discussion for more than twenty years, and in 1886 he was restored to his rank of colonel in the United States army. He died in 1901.

Porter, Horace, an American soldier and diplomat, was born at Huntingdon, Pa., April 15, 1837, and educated at West Point. He served during the Civil War as chief of ordnance in the army of the Potomac and in the army of the Cumberland, and as aide-de-camp to General Grant in the last year of the war. He also was Grant's military secretary for a number of years and, later, his private secretary. He reached the rank of brigadier-general during his career in the army, from which he resigned in 1873. In 1897 he was appointed ambassador to France a position which he filled till 1905.

Porter, Jane, author of *The Scottish Chiefs* and other works, was born at Durham, England, in 1776, daughter of an army-surgeon who died soon after her birth. She was brought up at Edinburgh and London, and made a decided reputation in 1803 by *Thaddeus of Warsaw*, a romance which was followed by her most famous work, *The Scottish Chiefs*, in 1810. This work has a remarkable interest for youthful readers, and had the merit of inspiring Sir Walter Scott to write *Waverley*. She died at Bristol, May 24, 1850.

Porter, Noah, president of Yale College, was born at Farmington, Conn., Dec. 14, 1811, and graduated at Yale in 1831. After teaching for a number of years and taking a course in theological study, he became pastor of a Congregational church at New Milford, Conn., and afterward at Springfield, Mass. In 1846 he was elected professor of metaphysics and moral philosophy at Yale, and, after filling that position for 25 years, in 1871 he was chosen president of the institution, a position which he held until 1886. He died at New Haven, Conn., March 4, 1892. Among Dr. Porter's numerous works are *The Human Intellect*, *Books and Reading*, *Elements of Intellectual Science*, *Elements of Moral Science* and an edition of *Kant's Ethics*. He edited *Webster's Unabridged Dictionary* and *Webster's International Dictionary*.

Por'tia, the heroine in Shakspere's *Merchant of Venice*, is a rich heiress whose hand is to be bestowed upon the suitor who shall choose the right casket among three. The caskets are of gold, silver and lead respectively. Bassanio is the fortunate suitor who both wins the love of the lady and chooses the right casket. When Antonio, Bassanio's friend, becomes security for Bassanio's debt to Shylock, he falls into peril of his life, from which the brave and clever Portia rescues him by pleading his case in court in the guise of a young lawyer. Portia is one of the sweetest and noblest of Shakspere's heroines, and one of her speeches has become world-famous. It is that beginning with the words: "The quality of mercy is not strained."

Port'land Ex'posi'tion, The, an international exposition held in Portland, Oregon, from June 1st to October 15th, 1905, to commemorate the one hundredth anniversary of the exploration of the northwest by Captains Meriwether Lewis and William Clark. The exposition derived its name from the city, the official title in full being The Lewis and Clark Centennial and American Pacific Exposition and Oriental Fair. It also is frequently referred to as the Lewis and Clark Exposition. The exposition was intended to tell the story, as the official title indicates, of the exploration and heroic achievement of a hundred years ago; of the development in a new-found land that gained the United States its western coast; and of the extension of American trade with the orient. As originally planned, only an exposition local to the northwest was contemplated; but, as the interest of the whole country became manifest, the scope of the undertaking broadened until it reached the proportions of an international exposition of the first rank. It was the first exposition of the kind ever held west of the Rocky Mountains. In natural beauty of setting it is considered by many to have surpassed all others. The national government contributed $470,000 in addition to contributing an exhibit, already prepared at a cost of more than $300,000; and nearly all foreign nations were well-represented. The unique feature was the Forestry Building, constructed entirely of logs of gigantic dimensions.

Portland, Me., largest city and chief port of entry in Maine, is situated on Casco Bay, about 60 miles from Augusta, the capital of the state, and about 100 miles from Boston. A number of islands in the bay are included in the corporation. The Grand Trunk Railroad and six other lines terminate at Portland, and regular lines of steamers connect the city with New York, Boston and other points on the Atlantic coast. The harbor, which is defended by five forts, is deep enough for vessels of all sizes and is seldom frozen. A large foreign trade is carried on with the West Indies and with European and South American countries, the annual imports and exports amounting to $15,918,492. Portland was permanently settled by an English colony in 1632. Neal Dow, Longfellow, Thomas B. Reed and N. P. Willis were born at Portland, and William Pitt Fessenden lived there. In 1866 a destructive fire swept over the city, destroying property to the amount of $10,000,000, but the burned district has long since been rebuilt. Population 80,000.

Portland, Or., the largest city of Oregon, is on Willamette River, near the point where it joins the Columbia, about 100 miles from the ocean and about 800 north from San Francisco. The city is beautifully located on a rising slope that extends from the river to the foot-hills. Five snowcovered mountain-peaks can be seen from Portland Heights in the west of the city; and the public park-system embraces more than 200 acres. The public buildings are costly and modern, and among them may be mentioned the Public Library, the Chamber of Commerce, the Northwestern Industrial Exposition Building; the city-hall, postoffice and customhouse, each occupying an entire block; Union Depot, Marquam Theater, Weinhard Building and many others, besides fine private residences. At Oregon City, twelve miles from Portland, are Willamette Falls, which furnish excellent power for manufacturing. Among the industries are lumber and flour mills, furniture, cordage, boot, shoe, carriage and wagon factories, breweries, planing mills, paper-bag factories, saddlery and harness works, paint-works, spice-mills and canneries. Portland has an admirable public-school system, with fine schoolbuildings, and spends more than $250,000 annually for the maintenance of schools. Higher educational institutions include Portland University, Portland Academy, Bishop Scott School, Saint Helen's School for Girls and the medical and law schools of the University of Oregon. Among the charitable institutions are the Portland, St. Vincent's and Good Samaritan hospitals. Electric power from Willamette Falls operates the electric lights and street-railways. Portland has an immense drydock and is a prosperous port of entry, large ocean-ships coming to this point. The annual clearing-house returns show a commerce of nearly $300,000,000, with an export trade of $15,000,000. Portland was founded in 1844 by New Englanders who named it for the Maine city, and became a city in 1851. Population 300,000.

Portland, Isle of, a rocky island or peninsula in Dorsetshire, England, connected with the mainland by a long, narrow ridge called Chisel Bank. It is four and a half miles long, one and a half wide and nine to ten in circumference. The coast is rough and precipitous, the only landing place being on the north, opposite Weymouth. From its highest point the Verne (495 feet) presents an almost unbroken slope to Portland Bill, the southern extremity, where stand two lighthouses, showing fixed lights 210 and 136 feet above the sea. Between this point and the Shambles is a dangerous reef three miles southeast, while a surf, called the Portland Race, is raised by the impetuous tides. By the construction of a magnificent break-water over two miles in length the building of which occupied twenty-three years, a harbor of refuge has been formed affording anchorage for many vessels. Portland is noted also for Pennsylvania Castle, erected in 1800 by a member of the Penn family. In 1931 the population was 12,018.

Port Royal, an island of Beaufort County, South Carolina, is situated in Port Royal Sound. It is about thirteen miles in length and seven miles in breadth. The chief city of the island is Beaufort. Here is Port Royal Harbor, one of the finest harbors to be found on the coast. The principal crops are cotton, rice, and vegetables. The island abounds in valuable lumber. Several forts were constructed here by the Confederates during the Civil War, which were seized by Union troops under the command of Du Pont in 1861.

Porto Rico. See Puerto Rico.

Port Said (*sä-ēd'*), a seaport of Egypt, is situated at the western entrance to the Suez Canal, on a strip of land lying between Lake Menzaleh and the Mediterranean Ocean. It was named in honor of Said Pasha, the promoter of the Suez Canal, and is the seat of the Governor-General for the canal. On the breakwater stands a statue of De Lesseps, who constructed the canal. A lighthouse in the town is visible for twenty-four miles at sea. Port Said has been greatly improved by the construction of extensive breakwaters, basins and quays, and the installation of waterworks and electric lights. It now has extensive accommodations for great seafaring vessels, and is one of the largest coal-stations in the world. Although its transportation facilities depend chiefly on the water, it is connected with Cairo by rail. There are extensive salt works on the eastern side of the harbor. The export trade consists chiefly of salt, cotton, hides and cigarettes, and amounts to about £320,000 ($1,600,000) annually. The annual imports are valued at £1,800,000 ($9,000,000). Port Said owes its existence to the Suez Canal. It was settled in 1859 when the work on the canal was begun. During the World War, Port Said was bombed several times in 1916 by Turkish aircraft. The population in 1927 was 104,603.

Portsmouth (*pōrts'mŭth*), a city in Rockingham County, and the only seaport in the state of New Hampshire, is situated on the Piscataqua River, three miles from the Atlantic Ocean. It is thirty-six miles northeast of Manchester and fifty-eight miles northeast of Boston. The city possesses the deepest harbor on the Atlantic Coast and one of the finest. It never freezes over. Portsmouth is therefore an important port of entry and has important coastwise trade. The city is rich in historical memories. It contains Governor Langdon's old residence, the old Assembly House, the Jackson House, the Gardner House, the Moffett-Ladd House, the home of General William Whipple who signed the Declaration of Independence, and the Warner house which was erected in 1712. At the mouth of the harbor stands Fort Constitution, now the headquarters of the mobile troops of the regular army in New England, and also for military training in the First Corps Area. Thomas Bailey Aldrich and James T. Fields were born in Portsmouth, which was the home of Daniel Webster. The Bullfinch public library, the Athenæum and the hospital are among the more important modern buildings.

The chief industrial life centers in the United States Navy Yard, which is situated on an island opposite. It contains the building in which the peace conference was held and the treaty signed ending the Russo-Japanese War in September 1905. There are facilities for docking the largest ships afloat. This is the Atlantic repair base for submarines, which are also built here. The Naval Hospital and the Naval Prison of the Atlantic Coast are located here. Many famous ships have been built at this Navy Yard. A great bridge in memory of American soldiers and sailors has been built across the Piscataqua to Kittery, Maine.

The most important industries include fishing, and the manufacture of shoe-buttons, automobile bodies, dye stuffs, shoes and chemicals. Portsmouth was first settled in 1623 by London merchants. The city was incorporated in 1649 as Strawberry Hill, which name was retained until 1653. A new charter, obtained in 1907, granted Portsmouth a commission form of city government. The population in 1930 was 14,495.

Portsmouth, a city and the seat of Scioto County, is situated on the Ohio River at the mouth of the Scioto River and the southern terminus of the Ohio Canal. It is 107 miles southeast of Cincinnati. Portsmouth is served by three railroads, and has steamboat connection with all Ohio ports. There are beautiful parks, a Carnegie Library, the Peebles Reading Room, a city hospital, and several philanthropic institutions and attractive churches. The city is located in a rich agricultural district which also abounds in coal, fire-clay and sandstone. It is an important commercial and manufacturing center. The chief industries of the city include iron foundries, brickyards, machine shops, railroad terminals, stove and range works, steel works, car shops, rolling mills, stone sawmills, hub and spoke factories, paper-box factories, a fire-brick plant, shoestring and muffler factories, and the manufacture of boots and shoes. The city was settled in 1803 and incorporated in 1814. The population in 1930 was 42,560.

Portsmouth, the chief naval arsenal of Great Britain, is situated on the southwestern shore of Portsea Island, at the entrance to Portsmouth Harbor and opposite Gosport, with which it is connected by a steam-ferry. The fortifications comprise, on the landward side, the outer line of the Portsdown forts and the Hillsea lines; to seaward, the Spithead forts. Portsmouth Harbor, only about 400 yards wide at its entrance, expands into a spacious basin, extending inland about four miles and having a breadth of three miles along its northern shore. This harbor is situated in the middle of the channel, close to the anchorage of Spithead, where 1,000 ships of the line may ride without danger or inconvenience, and is under the shelter of the Isle of Wight. Opposite to it is the French arsenal of Cherbourg. Population 217,989.

Portsmouth, Va., the capital of Norfolk County, on Elizabeth River, opposite Norfolk, with which it is connected by ferry. On the southern suburb of Portsmouth is the U. S. navy-yard, and on the northern suburb is the U. S. navy-hospital. Among the industries are cotton-mills, storage-plants and lumber-yards. Portsmouth is served by the Seaboard Air-Line; Atlantic Coast Line; Norfolk and Southern; and other railroads. Population 65,000.

Por'tugal, a republic in Europe on the western side of the Iberian peninsula, about 350 miles in length and from 70 to 140 in width. It is bounded on the north and east by Spain and on the south and west by the Atlantic. Total area (including the Madeiras and Azores) 35,490 square miles. The population increases steadily, but slowly. In 1851 it numbered only a little over 3,000,000; in 1874 it was over 4,000,000; and by the most recent census it was 5,423,132.

The most important mountain range is the Sierra da Estrella, a westward continuation of the Spanish Sierra Guadarrama system; and the Spanish Sierra Morena also continues westward in southern Portugal. Ocean-breezes temper the climate, and exempt it from the dry heat to which Spain is subject. The inequalities of surface, however, produce considerable diversities of climate; though snow falls abundantly on the mountains in the northern provinces, it is never seen in the lowlands of the southern districts, where spring begins with the new year and harvest is over by midsummer. The soil generally is fertile; but agriculture is in a backward state, little more than half the area being put to profitable use. The most prosperous branches of industry are the cultivation of the vine and the olive; from the former is derived the rich red wine, familiarly known as port from its being shipped at Oporto, "the port." The total quantity of wine annually exported from Portugal (chiefly to Brazil, England and the Portuguese colonies) amounts to 20,000,000 gallons. Fish abound in all the rivers and off the coasts; and of late years attention has been given to the cultivation of oysters. The manufacturing industries are chiefly concentrated in Lisbon and Oporto. About 455,296 persons are engaged in manufacturing pursuits, and nearly half of these are employed in weaving wool. More than 1600 miles of railway are open, of which 580 miles belong to the state. The exports average about $35,000,000 annually, and the imports are nearly twice that amount. The chief mineral products include copper precipitate and copper-ore, cupreous iron pyrite, ore for sulphur, lead-ore, anthracite and lignite. The national debt has increased from about $100,000,000 in 1853 to nine times that amount at present. Every male Portuguese over 21 is liable to service in the army, the term being three years with the colors and nine in the reserve. On a peace-footing the army embraces about 30,000 men, the war-strength being about 175,380 men of all arms. The state religion is Roman Catholic, but toleration is extended to all creeds. Education is superintended by a council and is entirely free from the control of the church. Compulsory education was enacted in 1844, but is not generally enforced; and Portugal is far behind in education and intelligence. The one university, at Coimbra, established in 1290, is one of the oldest in Europe, and has 75 professors and 1,057 students. Lisbon has a learned society, the Academy of Sciences, and a public library of 250,000 volumes.

From the close of the Eleventh Century to October 5, 1910, Portugal was a monarchy.

In 1910 an armed rising drove the king into exile, separated church and state and set up a republic which was formally recognized by the powers September 11, 1911.

The Portuguese differ from the Spaniards, whom they regard with no small degree of hatred, mainly on account of attempts of Spain to subvert the independence of Portugal in the past. Lisbon and Oporto in 1900 had a population, the former of 356,009 and the latter of 167,955; no other town in the kingdom reaches 30,000. The history of Portugal in ancient times and for several of the first centuries of our era was that of the Iberian peninsula as a whole; but in 1143 Alfonso I made it an independent kingdom. During the latter part of the 15th and the earlier part of the 16th century Portugal ranked as one of the most powerful monarchies in Europe, and Lisbon was the distributing center of the products of the east as well as one of the most important commercial cities. But it so declined and degenerated that in 1580 Philip II annexed it to Spain. It remained subject until 1640, when it succeeded in recovering its independence; and in 1668 its independence was formally recognized by the Spanish government. But in her conflicts with Spain and the Netherlands Portugal lost many of her colonies, and the nation which had once been the greatest maritime power on earth became one of the weakest and most insignificant. Under the reign of Joseph I his minister, Pombal (*q. v.*), sought to revive the national credit and restore the government to its former vigor and efficiency; but, when Joseph's daughter Maria became queen, all progress was arrested. The insanity of Maria led in 1799 to the establishment of a regency under her oldest son; and, when that prince learned that Napoleon had resolved on the extinction of his dynasty, he left Portugal in 1807 and transferred the government to Rio de Janeiro in Brazil (*q. v.*), which at that time belonged to Portugal. Even after the

French were driven out of Portugal and Napoleon's power was broken, John continued to reside in Brazil, leaving Portugal to be governed by English officers. This gave rise to such abuses and discontent that in 1820 a constitutional form of government was proclaimed at Lisbon in place of an absolute monarchy. John hurried home, but was immediately forced to sign the new constitution and to recognize the independence of Brazil. (See PEDRO I). On John's death in 1826 Pedro IV organized the government after the model of the English and renounced the crown in favor of his daughter. But in 1828 Miguel, Maria II's uncle, gathered a number of the clergy, army officers and old nobility and was proclaimed king by the Cortes. Then ensued a period of great confusion and misrule; but in 1834 Miguel was overthrown and renounced all pretensions to the crown. Maria II remained queen until her death in 1853, when she was succeeded by Pedro V, her son. Upon his sudden death in 1861 he was succeeded by Dom Luis, his brother, who continued to reign until succeeded by Carlos I, his son, in 1889. Carlos (*q. v.*) was assassinated on Feb. 1, 1908, and was succeeded by Manuel II (*q. v.*), his younger son who was deposed as the result of the revolution which ended in the establishment of a republic. The dependencies still owned by Portugal include Macao in China; Timor in the Malay Archipelago; the Cape Verd Islands; and those of Sao, Thomé and Principe; Portuguese Guinea, Portuguese East Africa; and Angola. See *Portugal*, in the Story of the Nations Series, by Morse Stephens.

Portuguese (*pōr'tŭ-gēz*) **East Africa** is bounded on the north by Tanganyika Territory, on the east by the Indian Ocean, on the south by Union of South Africa and on the west by Lake Nyasa, the British Central Africa Protectorate, which runs into Portuguese territory from the north and east as that territory projects itself from the south and west into British Central Africa, by Rhodesia, Matabeleland and Transvaal. Lourenço Marques is the capital. The territories directly administered by the state are divided into the districts of Mozambique, Tete, Quilimane, Inhambane and Lourenço Marques. The Manica and Sofala region is under the administration of the Mozambique Company, under a royal charter running from 1891 to 1941, by means of which the country along the Zambezi is settling rapidly, convenient river transport and facilities for mineral exploitation being secured. The country between Rovuma and Lurio or Luli Rivers and Lake Nyasa is similarly served by the Nyasa Company. The principal imports are cotton, iron-work and drink; the leading exports rubber, certain ores, wax and ivory. Gold has been found at Manica coal in Tete. The Delagoa Bay railway, 347 miles long, runs for 57 miles through the colony, on to Pretoria. The Beira railway runs 204 miles through the colony, and connects with the British line between Bulawayo and Salisbury.

From Lourenço Marques railways run to Swaziland and the Transvaal and between Beira and Rhodesia. In 1903 there were 87 telegraph offices and 2,368 miles of line, Beira and Fort Salisbury, Lourenço Marques and the Transvaal and Quilimane and Chiromo being connected.

Portuguese Guinea lies on the Senegambian coast, enclosed entirely on the land side by French possessions, the Fuladugu country on the north and east and French Guinea on the south. It includes the neighboring archipelago of Bissagos, with the island of Bolama, on which is the capital of the same name, Bissao being the chief port. Its area is 4,440 square miles, and population (estimated) 820,000. The chief commercial products are rubber, wax, palm-nuts, ivory, hides, oil and seeds.

Poseidon (*pō-sē'dŏn*), the Greek name for the mythical deity called Neptune by the Romans. He was said to be the son of Chronos (Time) and brother of Zeus. He was the husband of Amphitrite. As his portion of the universe he chose the sea; and to the Greeks, surrounded by the sea, he naturally figures much in literature and art. Under him are all other sea-divinities. The waves are his horses; the trident his scepter; and he is lord of storms and giver of calm. He usually is depicted riding in his chariot; Zeus, as sitting upon the throne.

Po'sen before the World War (*q. v.*), a province of Germany but now a part of Poland. (See map af Europe.) The former province was part of the great plain of northern Germany, and there are several lakes in the east. About 60 per cent. of the area (11,190 square miles) is arable land and under cultivation, the principal products being grain, potatoes and hops. Posen formed an integral part of Poland till 1772, when the districts north of the Netze were given to Prussia; to these was added, in 1793, Great Poland, except Mosovia, the whole being incorporated under the name of South Prussia. In 1807 Posen was included in the duchy of Warsaw; but it was reassigned to Prussia by the Congress of Vienna in 1814 under the name of the Grand-Duchy of Posen. Population 2,099,831, of whom over half are Poles and the balance Germans.

Posen, the chief town of the province and a fortress of the first rank, is on the Warthe, 150 miles by rail from Berlin. In the 16th century it was an important trading mart, but before the end of the century it began to decline. The chief manufactures are artificial manures, agricultural implements, furniture and carriages. Population 117,034.

Post-Mor'tem Exam'ination (from *post*, Latin for after, and from *mors* or death). Examination of the body after death is a duty which has to be performed by physicians in a variety of circumstances, of which the most important are cases of sudden and accidental death and cases of illness in which the nature of the disease could not be determined.

Post-Of'fice, the department of government whose business it is to convey letters, papers, books and parcels not exceeding 20 lbs. and maintain Postal Banks (*q. v.*). It is so called from the posts along Roman roads where couriers were placed for conveying news and dispatches. Other ancient countries had similar posts; but in all cases they were for government service only, the carrying of private letters or dispatches being no part of their duties. The beginning of a postal service in the United States dates from 1639, when a house in Boston was employed for the receipt and delivery of letters for or from beyond the seas. In 1672 the government of New York colony established "a post to go monthly from New York to Boston;" and in 1702 it was changed to a fortnightly one. A general post-office was established in Virginia in 1692 and in Philadelphia in 1693. A deputy postmaster-general for America was appointed in 1692; and by an act of parliament in 1710 he was directed to keep his principal office in New York, "and other chief offices in some convenient place or places in other of her majesty's provinces or colonies in America." The system, however, was a comparative failure until Benjamin Franklin became postmaster-general in 1753. Franklin filled this office until 1774 with such ability and efficiency that when he was removed the net revenue of the department exceeded $15,000.

In 1789, when the new Federal government was organized, the post-offices in the 13 states numbered only about 75. The following table will show the progress during a little more than the first century of our history:

Years	Offices	Revenue	Expenditures
1790	75	$ 37,935	$ 32,140
1800	903	280,804	213,994
1810	2,300	552,366	495,969
1820	4,500	1,111,927	1,160,926
1830	8,450	1,850,583	1,932,708
1840	13,468	4,543,522	4,718,236
1850	18,417	5,552,971	5,212,953
1860	28,498	8,518,067	19,170,610
1870	38,492	19,772,221	23,998,837
1880	42,989	33,315,479	36,542,804
1890	62,401	60,858,783	66,645,083
1899	75,000	95,021,384	101,632,160
1910	60,144*	183,585,005	190,238,288

Expenditures exceed the receipts. This is due to the fact that the postage on papers, books etc. is so low that they must necessarily be carried at a loss and also to improvements in the service from year to year. Some idea of the vast business may be obtained from the total number of letters, papers, etc., carried in 1912: 17,588,658,941 pieces.

From the organization of the post-office department until 1816 the rate of postage on letters varied, according to distance, from eight to 25 cents. In 1816 these rates were so changed as to vary from 6¼ cents to 25 cents; and in 1845 the rate was reduced to five cents for each letter not exceeding one half ounce in weight and five cents for each additional half ounce or fraction thereof, carried under 300 miles; over 300 miles 10 cents. In 1851 the rate was made three cents for all distances under 3,000 miles, if prepaid, and five cents if paid on delivery. In 1855 a law was passed requiring all letters to be prepaid; and in 1863 the rate was made uniform to all offices in the United States; and by act of congress, approved March 3, 1885. the rate was reduced to two cents for each ounce or fraction thereof, carried to any part of the United States or territories. The same rate is charged for drop-letters where there is free delivery by carriers; where there is no such delivery, only one cent is charged.

Mailable matter is divided into four classes, of which letters and any matter sealed against inspection constitute the first. The second class embraces newspapers and all other periodicals issued regularly at least four times a year. The postage on this class is 1 cent per lb. when mailed by publisher or news agents, except that such periodicals may be sent to actual subscribers, living in the county where they are published, free of postage.

Third class matter includes books, and, in general, all printed matter, not issued periodically; it also extends to proof-sheets and manuscript copy accompanying the same and, in general, to any paper, cardboard or parchment on which an impression has been made by printing or other mechanical process, except the copying press or typewriter. The postage on matter of this class is one cent for each two ounces or fractional part thereof. The fourth class includes articles of merchandise and, in general, all mailable matter not belonging by its nature to either of the other three classes; but all matter included in this class must now be sent by PARCEL POST (*q.v.*). Matter belonging to the first, second and third classes may be registered on payment of ten cents in addition to the postage. In 1864 the money-order system was established at the leading post-offices, and has proved a great convenience. The following are the rates: For sums not exceeding $2.50, three cents; not exceeding $5, five cents, over $5 and not exceeding $10, eight cents; over $10 and not exceeding $20, 10 cents; over $20 and not exceeding $30, 12 cents; over $30 and not exceeding $40, 15 cents; over $40 and not exceeding $50, 18 cents; over $50 and not exceeding $60, 20 cents; over $60 and not exceeding $75, 25 cents; over $75 and not exceeding $100, 30 cents. A single money-order may include any amount from one cent to $100.

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*The decrease in offices is due to the introduction of rural free-delivery.

An interesting feature of the money order system in this country is the fact that foreigners use it for banking purposes, purchasing money orders and keeping them instead of depositing their money in the bank. Since the establishment of postal savings banks this practice is becoming less common.

The one-cent postal card was first issued in 1873, large numbers of which are now used for brief communications. The two-cent card, with a reply-card attached for the return of an answer, was first issued during 1892.

In 1864 the free-delivery system was introduced into the larger cities, and it has since been extended to practically all cities having over 10,000 inhabitants or doing a post-office business of over $10,000. Provision has since been made for the extension of this system to villages and rural communities, and this has been accomplished to such an extent that there are about 43,000 rural free-delivery routes. Post-offices whose annual compensation amounts to $1,000 or more are divided into three classes, first, second and third, and are filled by presidential appointment; those whose compensation is less than $1,000 constitute the fourth class. All fourth class post offices were placed under Civil Service (*q. v.*) by President Taft. The salaries of the postmasters appointed by the President vary from $1,000 to $6,000, according to the amount of business transacted. Salaries of fourth-class postmasters are derived from a percentage allowed on the cancellation of stamps, etc.

Foreign letter postage to Newfoundland, Canada, Mexico, Panama, Cuba, Great Britain and Ireland and to Germany (in direct steamers) is now two cents; to all other countries five cents.

Postal Savings Banks. Under an act approved June 25, 1910, postal savings banks were opened January 3, 1911, and were an immediate success, deposits reaching $25,000,000 by October 1, 1912. Any person, ten years of age or over, may begin with a $1 deposit or with 10 cents through a savings card system. Deposits are limited to $1 per month and to a total of $500. Annual interest of 2 per cent is allowed.

Potassium (*pô-tăs'sĭ-um*), a bluish-white metal discovered by Sir Humphrey Davy in 1807. It is the lightest of all the metals except lithium, and, as its specific gravity is only .865, it readily floats on water. In so doing it reacts violently with the water, forming caustic potash and giving off hydrogen, which ignites spontaneously from the heat of the reaction. At 32° F. it is brittle, like glass; at 59° it is soft and malleable; at 144° it becomes liquid. Potassium is widely diffused in the vegetable, animal and mineral kingdoms. Some of the more important potassium compounds are caustic potash (the hydroxide), the carbonate, the bicarbonate; also potassium chloride, bromide, iodide, nitrate (saltpeter), sulphate, chlorate, cyanide etc. Of these iodide, bromide and chlorate are used for medicines, the others being employed more or less in the arts.

Pota'to, the tubers of *Solanum tuberosum*, a genus of the nightshade family, which contains about 900 species, distributed almost everywhere, but most abundant in tropical America. Only about 25 species are found in North America. The potato, from which numerous cultivated varieties have originated, came from Chile, and is native in the mountains as far north as southern Colorado. The importance of these tubers as an article of food is well-known. It is sometimes called Irish or white potato, to distinguish it from the sweet potato, which belongs to a totally different plant The cultivated varieties of potatoes are exceedingly numerous, and additions to the list are being made yearly. That this tuber is a modified stem is apparent from the so-called "eyes," which are buds appearing in the axils of minute scales. As is well-known, these buds are able to develop into new plants, so that in planting the tubers care is taken in cutting them to include one or more eyes. In 1910 the acreage of potato-raising in the United States was 3,591,000 acres, and the value of the year's crop was estimated at $187,985,000. The total number of bushels in the gross yield was 338,811,000.

Potato-Bug or **Bee'tle,** a widely known beetle infesting potato vines. In 25 years it spread from the Colorado region to the Atlantic coast and from Virginia to Maine. Up to 1859 this insect fed upon the sand-bur, a wild plant related to the potato, but about that year it began to appear upon the potato vine. It multiplied rapidly and migrated eastward, causing extensive destruction. The second word in its Latin name (*Doryphora decemlineata*) refers to the ten dark lines on the wing-covers.

The orange-colored eggs are laid on the underside of a leaf in a cluster of about 50. The dark-red larvæ hatch within a week, feed for two or three weeks, then crawl under rubbish or burrow into the soil and there pass the pupa state and remain about ten days. About a month after hatching the adult beetle appears. There are two or three broods a year, the last brood in the beetle state lying dormant in the ground during the winter. When warm weather arrives, the beetles come forth in great numbers and fall greedily on the young potato-plants. The pest is successfully combatted by sprinkling plants with paris green mixed with water; or by dusting with this poison mixed with flour or pulverized plaster in the proportion of one pound to 20, used after a shower or a heavy dew.

Potential (*pō-tĕn'shal*), a term employed in physics, astronomy and electric engineering. The region round any attracting body where work has to be done to carry mass from one point to another is known as a field of force. The potential at any point in such a field of force is the amount of work required to bring up a unit mass from infinity to that point. It is to be noted that nothing is here said as to the path by which this unit mass is brought up, for the work is the same whatever the path, provided the attraction obeys the law of inverse squares. This quantity was first introduced into physics by Laplace in his *Mécanique Céleste;* but the name, *potential,* is due to George Green (1828). The enormous importance of this quantity in electrical science will be appreciated best by reading some such treatment as J. J. Thomson's *Elements of Electricity and Magnetism.*

Poto'mac, a river of the United States, formed by two branches which rise in the Allegheny Mountains in West Virginia and unite 15 miles southwest of Cumberland, Md., from which the river flows southeasterly for 400 miles and empties into Chesapeake Bay, after forming an estuary 100 miles long and from two to seven wide. A few miles above Washington it forms a cataract 35 feet high. Between this and Westport it falls more than 1,000 feet. The scenery in this portion of its course is wild and beautiful, especially where it passes through the Blue Ridge at Harper's Ferry. The Potomac forms a great part of the boundary line between Virginia and Maryland.

Potosi (*pō'tō-sē'*), a city of Bolivia, South America, nearly 50 miles southwest of Chuquisaca (Sucre). It is built on the side of the Cerro de Potosí, 13,000 feet above the sea, and is one of the loftiest inhabited places on earth. The streets are too steep or narrow for wagons or carriages, and fully half of the town is composed of tottering and ruined buildings, uninhabited and desolate. There are considerable changes in the climate, but it generally is very cold, owing to the snow on the surrounding mountains, which scarcely ever melts. Yet Potosí is one of the principal commercial towns of South America, the industry of the place being limited to silvermining. As the country near Potosí is unproductive, all supplies have to be brought from a distance. The town was founded in 1545, and in 1611 had 160,000 inhabitants, but its population does not exceed 23,450. The department of Potosí is rich in minerals and cattle, and has an area of 48,900 square miles, with a population of 325,615.

Potpourri (*pō'pōō'rē'*), a mixture of sweet-scented flowers, dried and placed in a vase with a perforated lid, that their odor may be diffused through the room in which they are placed. But it also signifies a dish of different viands, and corresponds in this sense to the *hotch-potch* of Scotland and the *olla podrida* of Spain. In music the name is applied to a selection of pieces strung together without much system or arrangement — a sort of medley.

Pots'dam, the chief town of the Prussian province of Brandenburg and second residence town of the royal family of Prussia, is situated on an island beside Havel River, 16 miles by rail from Berlin. It is a handsome city, with broad streets, public gardens and fine squares, and in the neighborhood are more than half a dozen royal palaces. The manufactories include sugar, chemicals, harness, silk, waxcloth and beer. Flower-gardening, especially of violets, is an active industry. Alexander von Humboldt (*q. v.*) was a native of the place. Potsdam owes its creation as a town to Frederick William, the Great Elector, and to Frederick II. Prior to that period it was a fishing village on the site of an ancient Slav settlement. Population 62,224.

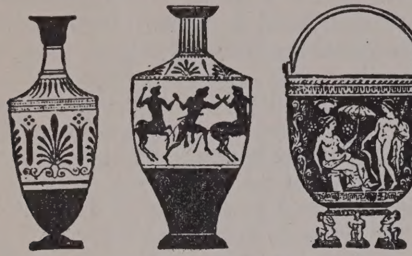
Pot'stone', a mineral composed of a mixture of talc, mica and chlorite. It is soft and easily cut when dug, but becomes hard after exposure to the air. It is made into pots and other utensils, which are cleaned by the fire. It was well-known to the ancients, and Pliny describes the manner of making vessels of it. It is quarried in Moravia, Norway, Sweden, Greenland and other countries.

Pot'tawat'tomies (signifying fire-makers), a tribe of North American Indians, belonging to the Algonquin stock. The early French settlers established a mission among them at Green Bay, Wis., and to this day many are Roman Catholics. They sided with the English during the Revolution and in the War of 1812, and afterwards settled in Kansas, where one band of over 400 now live in houses and cultivate the ground. Another band, 500 in number, is on a reservation in the same state, under the care of the Society of Friends.

Pot'ter, Paul, the greatest animal-painter of the Dutch school, was born at Enkhuizen in 1625, and was the pupil of his father, a landscape-painter, with whom he came to Amsterdam in 1631. He also was an excellent etcher and was so precocious that his best-etched pieces, *The Herdsman* and *The Shepherd,* were finished when he was only 18. He established himself at The Hague in 1649, but in 1653 he returned to Amsterdam. He died there in 1654, untimely. His *Dairy Farm,* measuring 48¼ by 19½ inches, was sold in London in 1890 for $30,450, or $65 the square inch.

Pot'tery, all objects of baked clay. This art is of high antiquity, being practiced among various races in prehistoric times. We find mention of earthenware in the Mosaic writings. The Greeks had important potteries at Samos, Athens and Corinth, and attained great perfection as regards form and ornamentation. Demaratus a Greek, the father of Tarquinius Priscus.

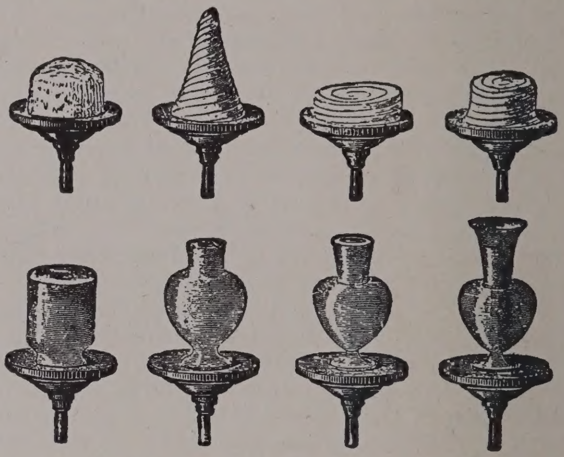
king of Rome, is said to have instructed the Etruscans and Romans in this art. The Arabs seem to be entitled to the credit of having introduced the manufacture of glazed ware into modern Europe. The Italians are said first to have become acquainted with this kind of ware as it was manufactured in the Island of Majorca, and hence they gave it the name of *majolica.* They set up their first manufactory at Faenza in the 15th century. In Italy the art was improved, and a new kind of glaze was invented, probably by Luca della Robbia. (See ROBBIA.) The French derived their first knowledge of glazed ware from the Italian manufactory at Faenza, and on that account gave it the name of *faience.* About the middle of the 16th century the manufactory of Bernard Palissy (*q. v.*) at Saintes in France became famous on account of the beautiful glaze and rich ornaments by which its products were distinguished. A little later the Dutch began to manufacture at Delft the more solid but less beautiful ware which thence takes its name. The principal improver of the potter's art in Britain was Josiah Wedgwood (*q. v.*) in the 19th century. Porcelain or chinaware first became known in Europe about the end of the 16th century through the Dutch, who brought it from the East. In the United States the manufacture of pottery and porcelain is of recent development but has already attained considerable dimensions, the leading establishments being located at Trenton, N. J., and at Cincinnati, Akron and East Liverpool, O.



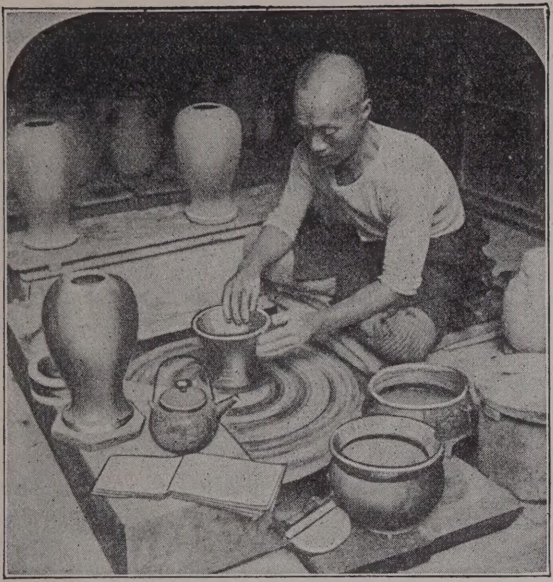
ETRUSCAN VASES

There are general principles and processes common to all kinds of pottery and porcelain. The first operations are connected with the preparation of the potter's paste, which consists of two different ingredients: an earthy substance, which is the clay proper and a siliceous substance, which is necessary to increase the firmness of the ware and render it less liable to shrink and crack on exposure to heat. The clay is first finely pulverized and reduced to the consistency of cream, when it is run off through a set of wire gauze or silk sieves into cisterns, where it is diluted with water to a standard density. The other ingredient of the potter's material is usually ground flints or flint-powder, as it is called, which, treated in much the same way as the clay, is finally passed as a creamy liquor into a separate cistern. These liquors are now mixed in such measure that the dry flint-powder bears to the clay the proportion of one sixth, one fifth or even more. The mixture is then forced into presses, lined with cloth, by means of a force-pump, the cloth retaining the clay and allowing the water to escape. The clay now forms a uniform inelastic mass, which is cut into cubical lumps and transferred to a damp cellar, where it remains until a process of fermentation or disintegration renders it finer in grain and not so apt to crack in the baking. It is then subject to another operation, called *slapping* or *wedging*, which consists in repeatedly breaking the lumps across and striking them together again in another direction, dashing them on a board etc. This final process of incorporation is now most frequently performed by machinery.

In making earthenware vessels, if they are of a circular form, the first operation after the paste has been made is turning, technically called *throwing* them on the wheel. This is an apparatus resembling an ordinary turning-lathe, except that the surface of the *chuck* or support for the clay is horizontal instead of vertical. The chuck in fact is a revolving, circular table, in the center of which a piece of clay is placed, which the potter begins to shape with his hands. The rotary motion of the table gives the clay a cylindrical form in the hands of the potter, who gradually works it up to the intended shape. It is then detached from the revolving table and dried, after which, if intended for finely-finished ware, it is taken to a lathe and polished. It is at this stage that the handles and other prominent parts are fitted on, which is done by means of a thin paste of clay called *slip.* The articles are now removed to a room in which they are dried more thoroughly at a high temperature. When they have reached what is called the *green* state, they are again taken to a lathe and more truly shaped as well as smoothed and burnished. When the articles are not of a circular form and, accordingly, cannot



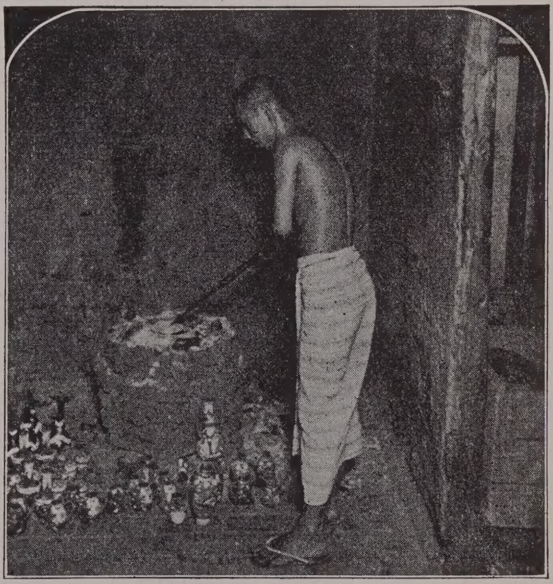
Successive Stages of Earthenware Vessel on the Potter's Wheel.



Japanese potter at his wheel, fashioning fine Kyoto ware.

Hotozan, a famous porcelain worker, painting gems of art in his workshop at Kyoto.

Japanese girls decorating fine pottery.



Firing cloisonne at Takatoni factory, Kyoto, Japan.

be produced by means of the wheel, they either are pressed or cast in molds of plaster of Paris.

When shaped and dried, the articles are ready for the kiln, in which they are exposed to a high temperature until they acquire a sufficient degree of hardness for use. After the kilns have been allowed to cool very slowly, the articles are taken out, and, if they are not to be decorated in color, sometimes also when they are to be so decorated, they are immersed in a composition called *glaze*, which, after the vessels have been a second time subjected to heat, is converted into a coating of glass, rendering the vessels impermeable to water.

There are two methods of printing on earthenware: Press-printing, which is done on the bisque, and bat-printing, done on the glaze. In both cases an engraving is first executed in copper and thence transferred, by means of a sheet of paper containing an impression, to the article requiring to be printed; but the processes differ slightly in detail. When the vessel has received its impression, it is ready to be fired in the enamel kiln. Painting on earthenware is effected with a brush over the glaze.

Porcelain or chinaware is formed only from argillaceous minerals of extreme delicacy, united with siliceous earths capable of communicating a degree of translucency by means of their vitrification.

The processes employed in manufacturing porcelain wares are much the same as those for other earthenware, but they require more delicacy and care. Metallic oxides incorporated with some fusible flux, as borax, flint etc., are used for painting on porcelain. The colors are mixed with essential oils and turpentine, and applied by means of a camel's-hair brush. When the painting is finished, the vessels are baked in peculiar ovens called *muffles*, which are also used for fixing the printed figures on the glaze of stoneware. In order to secure the desired tint the baking must be stopped at precisely the proper time.

Potts'town, Pa., a borough in Montgomery County, on Schuylkill River and Canal and on the Reading and Pennsylvania railroads, 18 miles southeast of Reading and 40 northwest of Philadelphia. Here are the plants of the McClintock and Marshall Bridge Company and of the Pottstown Iron Company, together with many industrial establishments for the manufacture of nails, pig-iron, boilers, carriages, agricultural implements and cigars. It has some schools, including Hill School, churches, libraries, banks and other civic institutions. Population 20,000.

Potts'ville, Pa., a borough, the capital of Schuylkill County, on the river of the same name, in the rich anthracite regions, 35 miles northwest of Reading and 92 northwest of Philadelphia. It was at Pottsville furnaces that hard coal was first successfully used for smelting purposes in 1839; it continues to be notable not only as a shipping-point for anthracite but as an industrial center; there are rolling, spike and planing mills, stove foundries, nut and bolt factories, machine and engine shops, silk, skirt and stocking factories and breweries. Buildings of prominence are the county court-house, the jail, a public hospital and Pottsville Athenæum. There are a school library and a county law-library, an admirable public and parochial school-system and a commercial college. Pottsville has the service of three railroads. Population 23,000.

Poughkeepsie (*pô-kĭp'sĭ*), **N. Y.,** a city, county-seat of Dutchess County, is on the east bank of the Hudson, 65 miles by rail from New York City. The Hudson is crossed by a steam-ferry and spanned by a railroad-bridge of masonry, steel and iron. Poughkeepsie is the largest town between New York and Albany; its manufactures include machinery, ironware, boots, shoes, clothing, chairs, glass, wheels, boxes, horseshoes, underwear, knit-goods, agricultural machines and automobiles. It also has a rolling-mill and a blast-furnace. Two miles north is the state's hospital for the insane, which cost $750,000; but Poughkeepsie has chief reason to be proud of its educational facilities. Famous Vassar College is just beyond the eastern limits, and the town contains Riverview Military Academy, Eastman National Business College and a number of academies and seminaries, besides the public schools. Poughkeepsie is quite noted for its homes for aged people, among which are the Old Ladies' Home, Vassar Brothers' Home for Old Men, Pringle Home for Aged Literary Men, Gallaudet Home for Deaf-Mutes and St. Andrew's Novitiate. Poughkeepsie has the service of four railroads. Population 43,000.

Poul'try (Latin *pullus*, a chicken), birds domesticated by man, usually embracing chickens, ducks, geese, turkeys and guinea-fowl. From the time when men began to abandon their wandering mode of life and settle in fixed habitations poultry in some form or other has taken the place of the wild birds which they are no longer able to snare and kill. Poultry are raised for the food furnished by their flesh and their eggs. Their flesh enters largely into the food-supply, and is both healthy and nutritious. The production of eggs in the United States in 1908 was 1,293,662,433 dozen. In France, where poultry are bred to so great an extent, there are no poultry-farms, in the exclusive sense, but fowls are kept by every farmer and cottager. The same remark applies to Italy, Denmark and Ireland, all of which export large quantities of eggs and poultry. In the vinegrowing districts of France fowls are permitted to wander among the vines nearly all the year, and they do excellent service in cleaning off insects as well as in manuring the ground. To make poultry profitable, they should be well-housed and well-fed, with sufficient space for obtaining gravel, grass, worms, garbage etc. Their houses should also be kept clean, as the richness of their manure makes the ground very foul. For laying-hens it has been found that soft food is very beneficial and that it should be given in the morning, with hard corn in the latter part of the day. Sitting hens should have a quiet nest, where they will not be disturbed during the 21 days required for incubation. Artificial incubation has been very largely adopted by poultry-raisers, most of the machines now sold working with great precision and regularity. The advantage of incubators is that they can be used at all seasons.

Pound, the English form of the Latin word, *pondus*, meaning weight, is now used in two distinct senses, *first*, a gold coin having the value of 20 shillings and, *second*, a standard of mass, equivalent to 7000. grains or 0.45359265 kilograms. The standard pound is not a "weight," but a "mass," and is kept at the Standard's office in London. The pound described above is the avoirdupois pound; the troy pound used only rarely by dealers in precious stones and metals has 5760. grains. The old English pound, which is said to have been the standard of weight from William the Conqueror to Henry VII, was derived from the weight of 7,680 grains of wheat all taken from the middle of the ear and well-dried. The pound weight of silver, the common money standard among the ancient Romans, was introduced by them into the countries which they conquered, and thus the term "pound" became the designation of a certain amount of coined money. The English pound is now considered as the simple equivalent in value of 20 shillings; but it originally denoted the actual pound of silver that was coined into 20 shillings. From the time of Edward II the coins were more and more diminished in size until the reign of George I, when the pound (in weight) of silver was coined into 66 shillings; and this rate still continues, the term "pound" meaning 20 of these shillings.

Pout'er. See PIGEON.

Pow'der, a general name for pulverised or minutely divided solid substances, has come to be specifically identified with gunpowder, a mixture of sulphur, charcoal and potassium nitrate. Gunpowder is now used in war far less than formerly, owing to the superior advantages of smokeless powders; but the production of it is considerable, and there is little likelihood that it will be superseded for such purposes as fireworks and military and naval salutes. The origin of gunpowder is obscure. The use of it for military purposes was suggested by Roger Bacon about 1266. But gunpowder was known in India and China, where saltpeter is very abundant, from time immemorial. Gunpowder was used in cannons as early as the battle of Crécy (1346). Its quality was very gradually improved. The French took the step, under the direction of Lavoisier, of carefully pulverising the ingredients in separate wheel-mills. It was gradually discovered that the quality and purity of the ingredients, especially the charcoal and niter, need careful attention. The niter is purified and transformed into small crystals by a process of boiling in water, filtration and rotation in crystallising vessels. Willow-wood is commonly used for charcoal. Even the sulphur has to be distilled and finely powdered. The proportion of the ingredients may vary; but in military powder it often is 75 parts niter, 10 parts sulphur and 15 parts charcoal. The greater part of the powder now produced in the United States is used, not for guns, but for blasting. See GUNPOWDER.

Pow'derly, Terence Vincent, an American labor-leader, who came into prominence as General Master-Workman of the Knights of Labor, was born at Carbondale, Pa., Jan. 22, 1849. He entered the employ of a railroad as a switch-tender at 12 and as a machinist at 19. He joined the Knights of Labor in 1874 and was elected mayor of Scranton in 1877 and 1878. He was raised to the chief office in the Knights of Labor at their meeting in Chicago in 1879, remaining master-workman until 1893. He studied law and was admitted to the bar in 1894. He was commissioner of immigration under President McKinley (1897–1902).

Pow'ell, John Wesley, an American geologist and anthropologist, was born at Mount Morris, N. Y., March 24, 1834, and served through the Civil War, in which he rose to the rank of major. After holding a professorship in Illinois Wesleyan University for a number of years, in 1870 a survey of the Colorado and its tributaries was placed under his direction by act of Congress. His voyage through the canyon was a wonderful achievement. While engaged in this service he gave special attention to ethnology, and in 1879 was made director of the new bureau of ethnology; in 1881 he was also appointed director of the United States Geological Survey. Major Powell in 1886 received the doctorate of philosophy from Heidelberg and of laws from Harvard; and in 1887 he was president of the Association for the Advancement of Science. His works include *Explorations of Colorado River; Lands of the Arid Region; Contributions to American Ethnology;* and *Outlines of the Philosophy of the Indians.* He died on Sept. 23, 1902.

Pow'er, a term used in physics and engineering to denote the *rate of work.* When an engine hoists a carload of coal from the bottom of a pit to the surface of the earth, it does the same amount of work whether the hoist be made in one minute or in one hour. Yet there is a very great difference between these cases; and we say that it requires a much more "powerful" engine to make the hoist in one minute. Accordingly, we define the *power* of an agent as the rate at which it does work, that is, the ratio of the work divided by the time. *Activity* is used as a strict synonym for power.

The *unit of power* most frequently employed in England and America is the horse-power, introduced by James Watt and defined as the activity of an agent capable of raising 550 pounds through a vertical distance of one foot in one second. The French horse-power is such that it will raise 75 kilograms one meter per second. In purely scientific work the unit of power is that which will accomplish the work of *one joule per second.* This unit is called a *watt;* and is numerically equal to 10^7 *ergs per second.* In electrical work the kilowatt (1,000 watts) is the unit most frequently used. Electrical energy, whether for lighting or for power purposes, is sold at so much per kilowatt-hour. It is important to remember that one horse-power equals 746 watts.

Powers, Hiram, a distinguished American sculptor, was born at Woodstock, Vt., July 29, 1805. While a boy he went to Cincinnati, O., and became an apprentice to a clock-maker. About the same time he formed the acquaintance of a German sculptor, who taught him to model in clay. In 1835 he went to Washington, where he executed the busts of several distinguished persons. Two years later he went to Italy to study his art, and resided in Florence until his death on June 27, 1873. There he produced his statue of *Eve* and numerous other works; but the famous production of his genius was the *Greek Slave*, of which six copies in marble and innumerable cast copies were produced.

Powhatan (*pou′hȧ-tăn′*). See POCAHONTAS.

Pozzuoli (*pŏt′sŏŏ-ō′lē*), formerly Puteoli, a city of southern Italy on the Bay of Naples, seven miles from the city, with which it is connected by a tramway. Pozzuoli is interesting from its memorials of ancient times. Its cathedral was the temple of Augustus. There are the remains of an amphitheater which seated 30,000 persons, in which Nero fought as a gladiator; of temples to Diana and Neptune; and of the ancient harbor. Population 22,830.

Præ′tor, originally the official title of the consuls of ancient Rome as leaders of the armies; but specially employed to designate a magistrate whose powers were scarcely inferior to those of a consul. The prætor's functions were chiefly judicial, his principal business (although he sometimes commanded armies in the field) being the administration of justice in matters both civil and criminal; and to the edicts of successive prætors the Roman law owed much of its development. Originally there was but one prætor; but in 246 B. C. a second prætor was appointed to settle disputes that might arise between Romans and foreigners temporarily residing in Rome. In 227 B. C. two new prætors were appointed to administer affairs in Sicily and Sardinia. A few years later there were two for the Spanish provinces. Sulla increased the number to eight and Julius Cæsar to 16.

Præto′rian Guard, a special body of soldiers organized for protecting the person and upholding the power of the Roman emperors. We read of a select guard of soldiers attached to the person of Scipio Africanus, but it was by Augustus that they were first organized as a separate force. He formed nine or ten cohorts of 1,000 men each, but kept only three at Rome. Tiberius, however assembled the nine cohorts in a permanent camp at Rome, while Vitellius increased their number to 16. They soon acquired great power, which they often exercised most unscrupulously, elevating and deposing emperors at pleasure. Candidates for the imperial dignity found it necessary to bribe them largely; while those who attained the position were accustomed to purchase their favor by liberal donations. After the death of Pertinax (193 A. D.) they sold the imperial purple to Didius Julianus for a sum of money; but in the same year their organization was broken up by Severus, who formed new cohorts out of the best legions serving on the frontiers, which he increased to four times the number of the old ones. After several other changes the prætorian guard was finally dispersed among the other Roman legions by Constantine the Great in 312.

Pragmat′ic Sanc′tion, a solemn ordinance of the head of a kingdom relating either to affairs of church or to those of state. The term originated in the Byzantine empire, and signified a public and solemn decree by a prince, in distinction from the simple rescript, which was a mere declaration of law in answer to an individual. This name is applied to several important treaties, of which the chief ones are (1) that of St. Louis in 1269 and (2) that of Charles VII in 1437, in both of which the rights of the Gallican church were asserted; (3) the instrument which settled the Holy Roman empire in the Hapsburg house of Austria in 1439; (4) the ordinance by which Charles VI of the Holy Roman empire settled his dominions on Archduchess Maria Theresa, his daughter; and (5) the settlement of the succession of the kingdom of Naples, which was ceded by Charles III of Spain in 1759 to his third son and his descendants.

Prague, the capital of Czecho-Slovakia (*q. v.*) a republic established after the World War, is situated on the Moldau, 220 miles from

Vienna and 120 from Dresden. It has a picturesque appearance from the beauty of its site and numerous towers, more than 70 in number, which rise above the many noble palaces, public buildings and bridges. The fortifications have been gradually demolished since 1866. The university, founded in 1348, received a new constitution in 1881, and had two co-ordinate sides or sections, one German and one Czech, the former with 150 teachers and 1,534 students and the other with 173 teachers and 3,875 students. There also is a government technical high school, with 1,300 students and German and Bohemian teachers. The city has been ravaged by wars, and here peace treaties have been enacted, notably that of 1635 between Ferdinand II and the Elector of Saxony and that of 1866 between Prussia and Austria, when the latter ceded her rights in Schleswig-Holstein and paid a war indemnity of $15,000,000. Population 228,645.

Prai'rie (French for meadow), the name by which the French explorers called the vast, fertile and treeless plains between Ohio and Michigan on the east and the desert-plains on the west. They embrace the western part of Ohio, nearly all of Indiana, Illinois and Iowa, the southern part of Michigan, the northern part of Missouri and parts of Wisconsin, Kansas and Nebraska. At Cairo, Ill., they are from 400 to 550 feet above the sea, while near the center of the state they average from 650 to 750 feet, and in the northern part they are from 800 to 900 and even 1,000 feet. In southern Wisconsin the highest points are 1,100 feet above the sea, while near Prairie du Chien the prairies are only 400 feet high. In Iowa the prairie-tableland of Nicollet is from 1,400 to 1,500 feet above the sea, and divides the waters of the Missouri from those of the Mississippi. The prairies on the headwaters of the Illinois and Wabasn Rivers and south and west of Lake Michigan are called flat prairies, because very smooth and level, while the regions broken by depressions of streams are rolling prairies. Trees are seldom seen west of the Mississippi, and near the 98th meridian they disappear altogether. East of the Mississippi they are found in scattered groves along the streams or on low, rocky ridges. Prairies have almost no stones, the soil being a vegetable mold, black and very rich, producing wonderful crops of corn and wheat. The mound-prairies near Puget Sound and elsewhere along the Pacific coast are thickly studded with earth-mounds, from three to four feet in height and from 30 to 40 feet in diameter at the base. The vast plains between the 99th and 104th meridians and from Big Horn Mountains south to Llano Estacado are arid and partly desert, although by irrigation they have recently been developed into fertile fields.

Prai'rie-Dog, a species of marmot belonging to the ground-squirrel family. The animal is in no sense a dog. It inhabits burrows on the western plains and prairies, throwing up hillocks, which often cover a large territory, making a "village." On the approach of travelers the animals are seen perched, often erect, on their hillocks. They are sociable little fellows, fond of company and of light and air. In search of food they will wander a short distance from home, but are ever on the alert to scurry back and dive down into safety. Their enemies include coyote, gray wolf, fox, badger, black-footed ferret and birds of prey. Prairie-dogs abound in Montana, Wyoming and western Kansas; are found from Texas, New Mexico and Arizona northward; and on the western slope of the Rockies in Utah and Colorado. They feed on buffalo-grass, and, when very numerous, work much harm; and are a pest to farmer and ranchman. There are two species, one living east and one west of the Rocky Mountains. They are about a foot long, and their fur is of a pale chestnut-brown color. Their bark is explosive and sharp, like a small dog's. They prefer sandy or gravelly soil, and make underground galleries of great extent. The small burrowing owl and a rattlesnake have been found in their burrows, but it is not now believed that this association is from choice, nor is it harmonious.

Pratt In'stitute was founded in Brooklyn in 1887 by Charles Pratt, a successful manufacturer deeply interested in promoting industrial education. The Institute is liberally endowed and equipped with thirteen adequate buildings. It is divided as follows: The School of Fine and Applied Arts; School of Household Science and Arts; School of Library Science; School of Science and Technology; School of Kindergarten Training. The day work of the Institute has three distinct divisions: Normal; technical training for trade use; and technical training for home use. The evening work is provided for those whose regular occupation prevents them from attending a day course. The requirements for admission vary with the different courses. Requirements for admission to the normal classes are such as may be met by a four-year course in a good high school. Applicants for all normal courses except the kindergarten must be at least nineteen years of age; for that course, eighteen years of age. For most of the other courses the minimum age is sixteen, but the applicant must possess sufficient maturity of mind to be able to grasp the work of the course he desires to enter. The institute conducts courses in tanning and applied leather chemistry in cöoperation with the National Association of Tanners. In this connection, research work of value to leather manufacturers is carried on. All the work of the shops in the School of Science and Technology is on a productive commercial basis, the commodities such as paint, soap and machinery being sold to firms ordering them. The system of physical training is admirably adapted to suit the peculiar needs of the institution. No intercollegiate contests are allowed, but all sports are intramural. During the life of the institute, 100,000 have been enrolled. The institution is well endowed and possesses excellent workshops and laboratories. There is also a gymnasium and a large library which is free to the public.

Praxiteles (*prăx-ĭt'ē-lēz*), one of the greatest sculptors of ancient Greece. Of his life little is known, except that he was a citizen of Athens in the 4th century B. C. His principal works, most of which have perished, were statues of Aphrodite, Eros, Dionysius, Apollo and Hermes carrying Dionysius. Feminine beauty and Bacchic pleasures were his favorite subjects, and in his treatment of these he displayed the greatest sweetness, grace and naturalness. He has been justly called the sculptor of the beautiful.

Preces'sion, is the name given to that slow motion of the earth which causes the equinoxes to recede slowly along the ecliptic (apparent path of the sun around the earth), so that the sun comes to them in its annual revolution a little *earlier* than it otherwise would. The cause of this motion is the attraction of the sun and moon upon the protuberant part of the earth about the equator — the equatorial diameter of the earth being 26 miles longer than the polar diameter. The moment of force thus exerted tends to tilt the earth, which, like a top, "precesses" instead of falling over. As this disturbing force on the earth is very small relatively to its mass, this turning of its axis about the pole of the ecliptic takes place at about the rate of 50.1″ *per annum*, and it therefore requires 25,868 years for the equinoxes to describe a complete circle on the ecliptic. See EARTH, POLE-STAR and TOP.

Pre'cious Stones. See STONES, PRECIOUS.

Pre-Emp'tion. Under the laws of the United States, an actual settler on the public lands enjoys the right, in preference to any one else, of purchasing at a fixed price the land on which he has settled, to the extent of 160 acres. In the case of offered lands, the settler must file his declaratory statement within 30 days after entry, and within a year proof must be made of settlement and cultivation and the land paid for at $1.25 per acre if outside the limits of a railroad grant or $2.50 if within such limits. If the tract settled on is unoffered, an approved plan of the township must first be received at the district land-office; the statement must then be filed within three months; and final proof and payment must be made within 30 months thereafter. Title to land is thus obtained much sooner than under the homestead laws; but a homestead settler may at any time after six months purchase the land under the pre-emption laws; as, on the other hand, the holder of a pre-emption claim may convert it into a homestead. See HOMESTEAD LAWS.

Pre-Raph'aelitism, a term used by Holman Hunt, J. E. Millais and W. M. Rossetti, three English painters of the 19th century, to denote their predilection for the great masters before the time of Raphael, who studied nature rather than technical rules and dogmas. The three representatives of the pre-Raphaelite school appeared in the exhibition-season of 1849, Millais with *Lorenzo and Isabella*, Hunt with *Rienzi* and Rossetti with *The Girlhood of the Virgin*, and excited the most flattering attention; but numerous critics and enemies arose, and in the third year of its existence the new school was threatened on all hands with the most powerful opposition. Happily, however, there appeared in the London *Times* three letters from Ruskin, denouncing the spirit of jealousy and injustice with which the young men had been assailed and pointing out the merits of their works and the great influence for good which the revival of their principles was likely to have. There followed later a succession of pictures from the three artists, whose titles have become as familiar as household-words. See HUNT, MILLAIS and ROSSETTI.

Pres'cott, Ariz., a city, county-seat of Yavapai County, on the Santa Fé, Prescott and Phœnix Railroad, formerly was the capital of Arizona. It now is an important mining-center. Cattle and timber are also produced in the district. Population, 6,000.

Prescott, William Hickling, a distinguished American historian, was born at Salem, Mass., May 4, 1796, and graduated at Harvard College in 1814. During his college-course his left eye was put out by a piece of bread playfully thrown by a fellow-student, and the other eye was soon sympathetically affected, so that he was obliged to live for many months in a darkened room. He next traveled in England, France and Italy, married in 1820, and abandoned the study of law for literature, devoting himself to intense study, although able to use his eye only a portion of the time. His first studies were in Italian literature; and it was not until 1826 that he entered on the work of his life,—the study of Spanish history. After laboring with great patience for years, in 1838 he issued his *History of Ferdinand and Isabella*, which at once gave him a brilliant reputation in America and also in Europe, and was translated into French, Spanish and German. In 1843 he published *The Conquest of Mexico* and in 1847 *The Conquest of Peru*. In 1855 he published two volumes of *The History of Philip II*, but before the third volume was completed he died of apoplexy at Boston, Jan. 28, 1859. Prescott's style alone would have given him great popularity; and to this day he is without a rival for clear and vigorous narrative and sustained power of color. He cannot be called a philosophical historian; modern investigation and discovery have corrected much in his picture of precolumbian American culture; but he is a master of narrative and incident, and there is not a dull passage in all his works. See his *Life* by George Ticknor.

Pressburg, Czecho-Slovakia, stands on the left bank of the Danube, 40 miles by rail from Vienna near to the old Austrian frontier. Its principal buildings are the cathedral, in which the kings of Hungary used to be crowned, the town-house and the parliament-house. The chief manufactures are beer, dynamite, wire, starch, spirits and confectionery. Pressburg or, to give it the Hungarian name, Pozsony was a prominent town during the 11th and 12th centuries, and was frequently chosen for conferences and meetings between the rulers of Austria and Hungary. From 1541 to 1784 it was the capital of Hungary. Pressburg was also the capital of the province of Pressburg. Population 65,867.

Pres'ident of the United States, the chief executive officer of the government, chosen by electors from the various states every four years. Nine presidents — Washington, Jefferson, Madison, Monroe, Jackson, Lincoln, Grant, Cleveland and McKinley— have been chosen for two terms; but a third term, although not prohibited by the constitution, is practically prohibited by the popular prejudice against it. Any native male citizen of the United States over 35 years of age is eligible to the presidency. The salary is $75,000 a year, but the president must receive no other emolument during his term from the United States or any state. In 1907 Congress appropriated $25,000 for his traveling-expenses. He is commander-in-chief of the army and navy; has the power to grant reprieves and pardons for offenses against the national or federal laws, except in cases of impeachment; and (by and with the advice and consent of the senate) makes treaties and appoints ambassadors, consuls and all United States officers not otherwise provided for. Every bill which passes Congress must have the approval of the president before it becomes law, unless two thirds of both houses pass it over his veto. The president administers the government through heads of departments, who are known as secretaries and constitute his cabinet. These officials are appointed by the president and confirmed by the senate. He also presents to Congress, when it assembles, a comprehensive statement of the affairs of the nation, with suggestions as to such matters as need its action. See UNITED STATES, DEPARTMENTS OF.

Presidential electors are chosen by the states, each being entitled to two electors at large and one for each congressional district, the total number at present being 531. A majority of all the electors chosen is necessary to an election of president and vice-president. If no candidate receive such a majority, the house of representatives must choose the president from the three highest numbers on the list, and the senate the vice-president from the two highest. In the election of president by the house the vote is by states, each state having one vote and a majority of all the states being necessary to a choice. The two presidents elected by the house of representatives were Thomas Jefferson in 1801 and John Quincy Adams in 1825.

The election of president and vice-president or, rather, the selection of presidential electors occurs every fourth year, on the Tuesday after the first Monday of November; and on the second Monday of January following these electors meet in the capitals of their respective states, cast their votes, and transmit the result to the president of the senate. On the second Wednesday of February the president of the senate counts these votes in the presence of both houses of Congress and announces the result. On the 4th of March thereafter the persons so chosen for president and vice-president are inaugurated for the term of four years. In case of the death or disability of the president the vice-president becomes president, and assumes all the duties of the office during the term for which he was chosen vice-president. If the offices of president and vice-president both become vacant, provision is made by law for filling the office of president from members of the presidential cabinet in the following order: (1) secretary of state, (2) secretary of the treasury, (3) secretary of war, (4) attorney-general, (5) postmaster-general, (6) secretary of the navy, (7) secretary of the interior and (8) secretary of agriculture.

The following is a list of the presidents of the United States, with the years during which they filled the office: (1) George Washington, 1789–97; (2) John Adams, 1797–1801; (3) Thomas Jefferson, 1801–9; (4) James Madison, 1809–17; (5) James Monroe, 1817–25; (6) John Quincy Adams, 1825–9; (7) Andrew Jackson, 1829–37; (8) Martin Van Buren, 1837–41; (9) William Henry Harrison, March—April, 1841; (10) John Tyler (chosen vice-president with Harrison), 1841–5; (11) James K. Polk, 1845–9; (12) Zachary Taylor, 1849–50; (13) Millard Fillmore (elected vice-president with Taylor), 1850–53; (14) Franklin Pierce, 1853–7; (15) James Buchanan, 1857–61; (16) Abraham Lincoln, 1861–5; (17) Andrew Johnson (elected vice-president with Lincoln in 1864), 1865–9; (18) Ulysses S. Grant, 1869–77; (19) Rutherford B. Hayes, 1877–81; (20) James A. Garfield, March—September, 1881; (21) Chester Allan Arthur (elected vice-president with Garfield), 1881–5; (22) Grover Cleveland, 1885–9; (23) Benjamin Harrison, 1889–93; Grover Cleveland, 1893-7; (24) William McKinley, 1897-1901; (25) Theodore Roosevelt (elected Vice President with McKinley), 1901-09; (26) William H. Taft, 1909-13; (27) Woodrow Wilson, 1913-21; (28) Warren G. Harding, 1921-23; (29) Calvin Coolidge, (elected Vice President with Harding), 1923-29; (30) Herbert C. Hoover, 1929-33; (31) Franklin D. Roosevelt, 1933-

Electoral votes of each state:

Alabama	11	Nebraska	7
Arizona	3	Nevada	3
Arkansas	9	New Hampshire	4
California	22	New Jersey	16
Colorado	6	New Mexico	3
Connecticut	8	New York	47
Delaware	3	North Carolina	13
Florida	7	North Dakota	4
Georgia	12	Ohio	26
Idaho	4	Oklahoma	11
Illinois	29	Oregon	5
Indiana	14	Pennsylvania	36
Iowa	11	Rhode Island	4
Kansas	9	South Carolina	8
Kentucky	11	South Dakota	4
Louisiana	10	Tennessee	11
Maine	5	Texas	23
Maryland	8	Utah	4
Massachusetts	17	Vermont	3
Michigan	19	Virginia	11
Minnesota	11	Washington	8
Mississippi	9	West Virginia	8
Missouri	15	Wisconsin	12
Montana	4	Wyoming	3
Total			531
Necessary to a Choice			266

See each President; POLITICAL PARTIES.

Press, Free'dom of the, is the right of every citizen to print whatever he chooses. The right, however, does not prevent his being amenable to justice for abuse of this liberty. In the early history of the press no such right was recognized, but the Roman Catholic church first originated censorship of the press. In 1515 that church formally decreed that no publication should be issued from any place over which it had jurisdiction without the written sanction of the bishop of the diocese. This policy of censorship was soon taken up by the civil authorities of the various states in continental Europe, and until very recent times it was an established rule that a free press was incompatible with an absolute government. While no censorship now exists in Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden or Switzerland, the press-laws in some of these countries are very rigid. In Spain, Germany and France the right is claimed and exercised of summarily suppressing publications deemed obnoxious to public peace and security. In France there is no constitutional guarantee in behalf of the freedom of the press. The constitutions of Switzerland and Prussia contain such guarantee, but empower the legislatures to place restrictions, which in some cases are very severe. In Russia the censorship of the press is still severe and arbitrary. In England, after a long and severe struggle, almost complete freedom of the press now prevails. Actual censorship was discontinued in 1694, but real freedom did not come for a century later. At present the only restriction upon the English press, except in cases of libelous matter, is the common-law rule that the publication of anything against the constitution of the country or the established system of government is an indictable offense. The American colonies suffered with the mother-country, but after their overthrowing English authority the principle of freedom of the press was proclaimed, and incorporated in the first state constitutions; a rule which all succeeding states without exception have followed. This freedom of course carries with it a degree of responsibility for any abuse of such liberty, but this responsibility has not rested heavily on newspaper men. The great freedom with which newspapers criticise and often ridicule government officials, especially by means of pictures and cartoons, has sometimes led to something of a reaction in favor of more stringent libel laws. The constitution of the United States prohibits Congress from passing any law abridging the freedom of the press, yet there is one instance of such legislation.

Pres'sure, in physics and in engineering the force per unit-area which a fluid exerts upon any surface. To obtain the total force which a fluid impresses upon any given surface we have, therefore, only to multiply the average pressure by the area of this surface. In pure science the *unit of pressure* is that which exerts a force of *one dyne per square centimeter.* A larger and often more convenient unit is that adopted by the Paris congress of physicists in 1900, namely, 1,000,000 dynes per square centimeter. This unit practically is exactly represented by the pressure exerted by a column of mercury 75 cm. high at sea level at 0°C. This larger unit is called a *barye.* One barye=10^6C. G. S. [centimeter-gram-second] units of pressure.

Pressure Gauge. See MANOMETER.

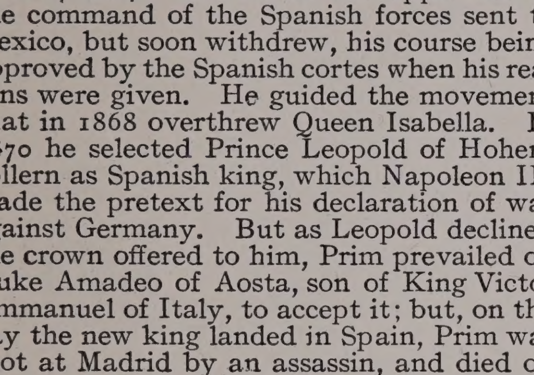
Preto'ria, the capital of Transvaal, formerly was the seat of government of the South African Republic, but was taken possession of by the British troops on June 5, 1900. It was named after Pretorius, the Boer leader. The town lies 1,000 miles northeast from Cape Town and 285 west from Delagoa Bay. It is connected with both by railways. Its white population was estimated at 10,000 at the outbreak of the war with Britain. It now is 75,000. See TRANSVAAL.

Pri'am, king of Troy at the time of the Trojan War, was the son of Laomedon and Strymo or Placia. The name means The Ransomed One, and was given on account of his having been ransomed by Hesione, his sister, from Hercules, into whose hands he had fallen. He was the husband of Hecuba by a second marriage, and had 50 sons, the best known of whom were Hector, Paris and Troilus, and a daughter named Cassandra. Priam is represented in Homer as too old to take an active part in the Trojan War, and only once appears on the field of battle. The oldest Greek legends are silent respecting his fate; but later poets, like Euripides and Vergil, say that he was slain by Pyrrhos (Neoptolemos) when the Greeks stormed the city.

Pric′kle, a spiny outgrowth, such as those which occur on the stems of roses. They involve not merely the epidermis but more or less of the cortex beneath. See EMERGENCE.

Prim, Juan (*ho͞o-än′ prēm*), a Spanish statesman, was born at Reuss in Catalonia, Dec. 6, 1814. In 1862 he was appointed to the command of the Spanish forces sent to Mexico, but soon withdrew, his course being approved by the Spanish cortes when his reasons were given. He guided the movement that in 1868 overthrew Queen Isabella. In 1870 he selected Prince Leopold of Hohenzollern as Spanish king, which Napoleon III made the pretext for his declaration of war against Germany. But as Leopold declined the crown offered to him, Prim prevailed on Duke Amadeo of Aosta, son of King Victor Emmanuel of Italy, to accept it; but, on the day the new king landed in Spain, Prim was shot at Madrid by an assassin, and died on Dec. 30, 1870.

Prim′rose, a general name of species of the primrose family (*Primulaceæ*), but more specially applied to a species of the genus *Primula*, which includes about 150 species, most of which belong to the northern hemisphere. About 13 species are native to North America. The most common primrose of cultivation is the so-called Chinese primrose (*P. sinensis*), a downy house-plant with enlarged calyx. The common English cowslip, whose cultivated varieties are known as different kinds of polyanthus, is *P. officinalis*. In the same family belong such forms as the beautiful American cowslip or "shooting-star" and the very similar cultivated *Cyclamen*.



PRIMROSE

Prince, a title given to the sons of kings, emperors and other rulers, sometimes with a territorial addition, as Prince of Wales or Prince of Orange. In various parts of continental Europe the title is borne by families of very high rank, but not possessed of sovereignty; but in England the term is restricted to members of the royal family. In a more general sense the word is often used for any ruler or sovereign.

Prince Albert, capital of the district of Saskatchewan, is 1,402 feet above the sea on the north branch of Saskatchewan River. It lies 249 miles north by rail and somewhat west of Regina on the Canadian Pacific Railway, 30 miles above the junction of the northern and southern branches of the river. Population 4,000.

Prince Edward Island, the garden-province of Canada, is a crescent-shaped island in the Gulf of St. Lawrence and snugly within the curve of the mainland of the two other maritime provinces. It is the smallest but most densely settled of the Canadian provinces. It is 140 miles long, and its width varies from two to 34 miles. The total area is about 2,184 square miles. The indentations of the coast are so numerous and great that no part is far from the sea. In 1534 Cartier called it a "low and beautiful land" — a fitting description, for the chief elevation is a chain of hills crossing it near the middle from New London Bay to De Sable. The sand-dunes, extending for forty miles along the coast, prevent the washing away of the land by the waves. The island, which owes its name to the Duke of Kent, is divided into Prince, Queens and Kings Counties. When laid out, each county was given a site for a capital, with two public domains called royalties and commons. Only two of these prospective towns, Georgetown in Kings and Charlottetown in Queens, became capitals, Summerside being the capital of Prince. The population in 1911 was 93,728— almost wholly of Canadian birth. People of Scotch and English origin predominate. Roman Catholics are the most numerous, then Presbyterians, then Methodists. The island is connected with the mainland during the summer by two steam-ferries, one between Summerside and Point du Chene (New Brunswick) and the other between Charlottetown and Pictou (Nova Scotia). Both tap the insular system of railways and meet spurs of the Intercolonial. In the winter two ice-breaking steamers keep these lines open. The Prince Edward Island Railway covers the island from end to end and taps all prominent towns. The summer climate makes the island a paradise for tourists. Atlantic fogs are practically unknown, because of the sheltering hills of Cape Breton and Newfoundland.

Agriculture is the chief industry, about 80 per cent. of the population being engaged therein. For the new world the province is thoroughly cultivated, 85 per cent. of its area being occupied. The fertile soil is easily enriched by sea-manures. The breeding of live stock for export is carefully fostered. Poultry is raised for the Sydney market.— a noteworthy contrast to the day when the island fed the fortresses of Louisburg and Quebec. Now it feeds a coalmining city. The farmers' season is short but profitable. A provincial-government experimental farm has been established for half a century, and there are eight model orchards throughout the province. The fisheries (lobster, oyster and herring) are profitable. The Malpeque is the oyster of Montreal; it comes from Richmond Bay on the ocean-side of the island.

Educational advantages are excellent. Prince of Wales College and St. Dunstan College are important institutions and are affiliated with McGill and Laval. There is a free public-school system, the schools being supported both by local taxation and by government grants. Schoolhouses are seldom more than three miles apart, so well is the island supplied. Sir William C Macdonald of Montreal has established a consolidated school near Hillsborough, where among other things manual training, home-science and nature-study are provided. There also are Macdonald rural schools throughout the province. At Charlottetown there are the noticeably fine building of Prince of Wales College and Normal School, a government (undenominational) institution. Its diplomas are accepted at McGill (Montreal). The Roman Catholic College of St. Dunstan, which is affiliated with Laval, the Roman Catholic university at Quebec and Montreal, also is in Charlottetown. Charlottetown is the capital (population 12,000). It is situated on a fine harbor in the middle of the province. Summerside and Georgetown (winter-port) are the next in importance.

Prince of Wales is the title usually borne by the oldest son of a reigning sovereign of Great Britain. The monarchs of Wales (*q. v.*) during its independence were so designated, and upon its becoming a part of England the principality of Wales was bestowed by Edward I (1283) upon his son, afterwards Edward II. In 1343 the title was bestowed upon Edward the Black Prince, and from that time to the present the custom has been followed by each reigning sovereign of Great Britain. The title is not inherited but bestowed, and usually some time after the coronation of the sovereign. On the death of a Prince of Wales the title has been transferred to the next heir apparent, if a male. An annuity of $200,000 was settled upon the Prince of Wales by 26 Vict. c. 1. By statute the Prince of Wales becomes a Knight of the Garter as soon as he receives the former title. The particular badge of the Prince of Wales is a design of three white ostrich-feathers encircled by the ancient coronet of Wales and accompanied by the motto: *Ich dien* (I serve). This device is said to have been assumed by the Black Prince in 1346, when he took such a plume from John, King of Bohemia, whom he slew in battle. The origin of the motto has never been satisfactorily traced. See YORK, DUKE OF.

Prince Rupert on Kaien Island south of Port Simpson, British Columbia, has been selected as the Pacific terminus of the Grand Trunk Pacific (*q. v.*). The route round the world will be shortened by this road. It brings Liverpool nearer to eastern markets.

The Princess, a medley by Tennyson, is among his earlier productions and appeared in 1847. The story is a single one, told in blank verse in seven cantos with a prologue and a conclusion and with a lyrical song between each canto. A princess of the south has been betrothed to a prince of the north in early childhood. She, however, was not favorably inclined to the marriage when she had matured. She felt the call to something higher. Consequently she set up a women's college in entire isolation from the world, it being an inviolable rule that no man should ever enter. The outcome of the story is that the college fails, the princess weds and thus illustrates that knowledge and high intellectual and esthetic ideals apart from real social life are impotent. A child is one of the potent means of arousing and bringing the princess to her true self The poem is a medley in that it unites in itself the medieval and the modern, the serious and the farcical, the congruous and the incongruous, the possibly real and the impossibly fanciful. The lyrics between the cantos are the most delightful parts of the poem, and critics are well-agreed that when *The Princess* has been forgotten these exquisitely beautiful songs will live. Aside from their own beauty, they assist in interpreting and predicting the meaning of the whole poem.

Prince'ton, N. J., a borough in Mercer County, 50 miles by rail from New York and about the same distance from Philadelphia. On January 3, 1777, it was the scene of a battle between the British under Colonel Mawhood and the Americans under Washington, in which the British were defeated. The place, however, is chiefly celebrated as the seat of the Princeton University and of Princeton Theological Seminary. Population, 7,864.

Princeton University, founded in 1746, at Elizabeth, N. J., as the College of New Jersey, removed to Newark in 1748, and to Princeton in 1756. Its name was changed to the present form in 1896. Its second president was Aaron Burr, Sr., and among other distinguished presidents have been Jonathan Edwards, John Witherspoon, Francis L. Patton and Woodrow Wilson. Nassau Hall, the oldest building, was a barracks and a hospital during the Revolution. The university consists of the Undergraduate Department, the School of Electrical Engineering, and the Graduate School. Besides 5 college fellowships and a number of graduate scholarships, there are 45 university fellowships and 172 undergraduate scholarships. Characteristic of Princeton are, first, its coherent plan of undergradute liberal studies, based on prescribed fundamentals and providing increasing freedom for the student by a gradual opening of elective studies grouped in departments; second, its preceptorial method of undergraduate instruction, or teaching by means of small conferences on assigned reading; third, its student self-government as illustrated in the "honor system," and the senior council of undergraduate control; fourth, its communal and democratic undergraduate life in the dormitories, which is the chief source of the alumni loyalty, fifth, the higher intellectual life of the residential buildings of the graduate school.

Principé or **Prince's Island** is a Portuguese possession in the Bight of Biafra, due east of French Kongo. It forms an independent colony with São Thomé (*q. v.*). Its population is 4,327.

Print'ing is the art of producing impressions from characters and figures on paper or any other substance, but in this article it is confined to the art of making impressions with movable types, which may justly be esteemed among the greatest of human inventions. Notwithstanding the importance of this invention, it is not certain to whom the credit belongs, as it is contested by the Hollanders in favor of Laurens Coster (1423) and by the Germans in favor of Johann Gutenberg (1438). The most general opinion would seem to be in favor of Gutenberg, but it is not impossible that both made the invention about the same time, during the first half of the 15th century. Between 1450 and 1455 Gutenberg printed a Bible, copies of which are still in existence although exceedingly rare and valuable; and, besides this Bible, some other specimens of work from his press at Mayence (Mainz) have been discovered. The Dutch at Haarlem preserve and show similar specimens of early printing by Coster. Mayence, Haarlem and Strassburg certainly were the places where printing was done before the art extended to Rome, Venice, Florence and other European cities. The art was introduced into England in 1474 by William Caxton, who set up a press by Westminster Abbey. The first printing-press in the United States was set up in the house of the president of Harvard College at Cambridge, Mass., in 1639, and in 1674 another was established in Boston, after which other presses were gradually introduced throughout the colonies. Until the beginning of the 17th century the press used was a screw-press, with a contrivance for running the form of types under the point of pressure; force having been thus applied, the screw was relaxed and the form withdrawn, with the impression executed on the paper. The defects of this press were at length partially remedied by William Jansen Blaen of Amsterdam, who invented a press in which the carriage holding the form was wound below the point of pressure, which was given by moving a handle attached to a screw, hanging in a beam having a spring, which caused the screw to fly back as soon as the impression was made. This kind of press, which was mostly of wood, continued to be used until the beginning of the 19th century. The first improvement on this press was made by the celebrated Earl of Stanhope, who constructed a press of iron and applied such a combined action of levers to the screw as to secure easier and more efficient working. Numerous improvements succeeded, the screw being dispensed with, and the pressure being effected by levers. The chief among these was the Columbian press, invented by George Clymer of Philadelphia in 1818.

Meantime, in 1811, Frederick König, a German printer, had invented a press in which the impression was given by a cylinder, the inking being done by rollers and the paper being carried through the machinery on tapes. John Walter of the London *Times* was so favorably impressed with this method of printing that he engaged König to make a double cylinder-press which should print two copies of a form at each revolution of the cylinder, but only on one side of the sheet. This press, which was completed in 1814, made about 1,800 impressions an hour, and was the first printing-press in the world operated by steam. A few years later König invented an improvement on this press, in which the sheet, after an impression had been made on one side by one of the cylinders, was turned over to receive an impression on the other side by another cylinder; but the march of improvement did not stop here. The circulation of newspapers increased to such an extent that in 1855 Richard M. Hoe of New York brought out the rotary printing-press, in which the pages of type were placed on a horizontal cylinder revolving on its axis, against which the sheets were pressed by a number of smaller cylinders, which were so arranged in a framework as to require a feeder for each one of these smaller cylinders. Such a press with six cylinders, each making 2,000 impressions an hour, could turn out 12,000 sheets, printed on one side, in an hour, and those with eight and ten cylinders in proportion. But the Hoe machine, with all its advantages, printed only one side at a time, and between 1863 and 1868 the Walter press was devised, by which printing is done from a continuous roll of paper, which is printed on both sides from stereotype plates, cut in separate sheets and pasted. This press, when first introduced, printed from 12,000 to 15,000 sheets per hour; but since that time many other web-printing presses have been introduced, by which sheets of four pages are printed at the rate of 50,000 or more an hour. By the introduction of steam-presses the trade of the printer has undergone a remarkable revolution in the past century. Though fewer hands are needed for working the presses in proportion to the amount of printing done, the increase of employment to compositors, bookbinders etc. has been very great. The manufacture of printing-machinery, as well as the manufacture of paper, has itself become a great industry, and no one can safely predict what progress will be made in this field during the 20th century. See *The American Dictionary of Printing and Bookmaking.*

Prism, an optical instrument composed of two plane, refracting surfaces. The angle between these two planes is called the refracting angle of the prism. Since in any kind of matter, except ether, lights of different color travel with different speeds, it follows that lights of different color will each have a different direction impressed upon them on passing through a prism. A prism thus produces "dispersion" in a beam of white light and is used, therefore, in the spectroscope to separate the various colors which compose the incident beam. Any transparent material whose refractive index is desired is genearlly cut in the form of a prism; for on measuring the angle of deviation for any ray, call it D, and the refracting angle of the prism, which we may call A, we have the following relation:

$$\text{Refractive index} = \frac{\sin\left(\frac{A \text{ X } D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

See also the articles on LIGHT and SPECTROSCOPE.

Pris'oners of War are persons captured from the enemy during military or naval operations. In ancient times the treatment of prisoners of war was very severe, it being no uncommon thing to put the population of a conquered city or state to the sword or to reduce them to slavery. Although the practice of putting prisoners to death became less frequent as the principles of Christianity became more widely diffused, they and their families were commonly reduced to slavery as late as the 13th century. By degrees the more humane custom of exchanging and paroling prisoners was adopted, although in all wars there still is more or less of suffering among prisoners.

Pris'ons, strange to say, are a development of civilization, and also of personal liberty. The abolition of slavery and the decay of the feudal system made it necessary in all countries to take the punishment of crime out of private hands and turn the offender over to the power of the state. In the exercise of this power governments have punished their subjects by death, direct torture, transportation, exposure in the pillory etc. All these, except death, have been abandoned by most of the civilized nations; and in all of them death is inflicted only for the most serious offenses, and, as a consequence, imprisonment for a greater or lesser period is resorted to as a means of protection to society. How crudely, how barbarously, this power has often been exercised has in part been revealed to the world If the whole story could be told, how dark would be the picture! It is a relief to turn from the contemplation of the miseries and horrors of prison-life to the efforts that are being made by prison-reformers throughout the world to reduce prison-discipline to a humane system and make it a means of reformation to the prisoner as well as a means of protection to the public. The prisons of the world are yet very far from perfection; but in every civilized nation there are earnest men and women studying all the questions connected with prison-reform, and the results already are seen in a more intelligent and Christian system of discipline. In the United States, especially, our jails and penitentiaries have been relieved of many degrading features. and in a number of the states reform-schools have been established for juvenile offenders. In 1877 New York established a reformatory at Elmira for the reception of all prisoners under 30, in which, while strict order and discipline are maintained, the inmates are carefully trained and educated and encouraged to earn a parole and even a discharge by good conduct and thorough reformation. In Ohio, in addition to a reform-shool for girls at Delaware and a reform-farm for boys at Lancaster, an intermediate penitentiary has been established at Mansfield, which is conducted after the manner of Elmira Reformatory. Similar steps have been taken in other states. See *The State of Prisons in the Civilized World* by Wines.

Pri'vateer, a ship owned by a private individual or by a number of individuals, which, under letters of marque (*q. v.*), makes war upon the shipping-commerce of a hostile power. Privateering was abolished among European nations, except Spain, by the treaty of Paris in 1856; but the United States never signed this agreement. During the War of 1812 and to some extent during the Revolutionary war British commerce suffered severely at the hands of American privateers, there being over 200 of these afloat during 1812–14. In the Civil War the Confederate privateer, *Alabama*, captured a considerable number of United States merchant-vessels, for which England afterwards paid damages for allowing a privateer to depart from one of her ports. By act of congress, passed in 1864, the entire proceeds of a prize taken by a privateer go to the captors, unless otherwise provided and specified in the ship's commission, the sum awarded being divided equally between the ship's company and her owners. See ALABAMA CLAIM

Priv'y Coun'cil, an institution peculiar to the English government, having its origin in feudal times, when it was the custom of the sovereign to summon his barons and nobles to give him advice in matters of state. The list of privy councilors includes, besides the prime minister and members of the cabinet, the archbishops of Canterbury and York, the bishop of London, the lord chief-justice of England, the lord-chancellor and numerous dignitaries. In ordinary cases only the cabinet ministers; the great officers and the archbishop of Canterbury are summoned to the meetings, but in extraordinary cases the whole body is summoned. In theory the cabinet is only a committee of the privy council, but, in fact, power is exercised by the cabinet alone, and the privy council is only occasionally or rarely consulted. The privy council cannot, however, be truthfully described as dead or obsolete, as it still exercises important powers in special cases. In 1788 it took on itself the duty of inquiring into the sanity of George III, and in 1821 it determined the constitutional question of Queen Caroline's right to be crowned as queen-consort. Still, in a general sense, it may be described as a reserve force, kept apart from the active and working forces of government.

Proa (*prō'ă*) is a peculiarly shaped canoe used by the natives of the Malay Archipelago and on the China Seas, especially by the Ladrone Islanders. It is about 30 feet in length by three in width, and has the stem and stern equally sharp, so as to change its course without being turned around. One side is flat and in a straight line with stem and stern; the other side is rounded like an ordinary boat. This peculiar formation would make it easy to upset, were it not for a framework which projects to windward and supports a weight which counterbalances the great pressure of the wind on the sail.

Proc'ter, Bryan Waller ("Barry Cornwall"), was born at London, Nov. 21, 1787. Educated at Harrow with Byron and Peel, he came to London when about 20, and soon began to contribute poetry to *The Literary Gazette.* A few years later he published four volumes of poems, and produced a tragedy at Covent Garden Theater, whose success was largely due to the acting of Macready and Kemble. He was a metropolitan commissioner of lunacy from 1832 to 1861, and died on Oct. 4, 1874. His works, issued under the pseudonym of Barry Cornwall, comprise *Dramatic Scenes*, *A Sicilian Story*, *Marcian Colonna*, *The Flood of Thessaly* and *English Songs*, besides *Memoirs of Kean* and *Charles Lamb*. See *Bryan Waller Procter, an Autobiographical Fragment*, edited by Coventry Patmore.

Proctor, Richard Anthony, distinguished English astronomer, born at Chelsea, March 23, 1837, and educated at St. John's College, Cambridge. From 1865 he devoted himself to astronomy. He lectured in America in 1873 and 1875. He died at New York Sept. 12, 1888. A memorial observatory was erected in his honor near San Diego, Cal.

RICHARD A. PROCTOR

Progressive Party, formed in Chicago in 1912, when the Republican presidential convention refused seats to delegates pledged to nominate Roosevelt. A later Progressive Convention nominated him on a platform pledging direct primaries, initiative, referendum, recall, woman suffrage, numerous industrial and other reforms. The Progressive Convention of 1916 voted to support Charles E. Hughes, the Republican candidate.

Prohibition. The Great War may be given credit for somewhat hastening the day of absolute prohibition of the manufacture and sale of alcoholic drinks for beverage purposes in the United States. On Aug. 10, 1917, Congress conferred upon President Wilson the power to "prohibit the use of grains, fruits, and other foods for the production of distilled spirits for beverage purposes" during the war. This the President did. The national prohibition amendment to the constitution passed both Houses of Congress in Dec., 1917. On January 16, 1919, it was ratified by three-fourths of the states, and the amendment came into effect Jan. 16, 1920. On May 27, 1919, Representative Volstead of Minnesota, Chairman of the House Judiciary Committee, introduced a bill providing for the enforcement of prohibition in all its phases, including the war-time law and the later amendment. President Wilson vetoed this bill because it included the enforcement of the war-time measure, which, he thought, should not be operative after the stated cause of passage (the war) was over. Congress passed the bill over the President's veto, and the law became effective Oct. 28, 1919.

Projectiles have been used in offensive warfare from very early days. At first they consisted of stones, arrows, darts, etc. Gunpowder came into use about the middle of the 14th century, and the invention of guns immediately followed. Arrows and darts then largely passed out of use, but for more than a century afterwards stones constituted the chief material for projectiles. Bags of small pebbles were sometimes used. Iron came into use in the 15th century. At first wrought iron was used, then cast iron. Lead has been used from an early date, but only for case-shot and small arms. The first guns were smooth-bore and muzzleloading. Not until the middle of the 19th century were rifled breechloading guns successfully used. Projectiles may be divided into two general classes: spherical and oblong. Spherical projectiles were used almost exclusively in the smooth-bored guns, and, with them, have about passed out of use. There are three varieties of the oblong projectiles: the solid shot, the hollow shot or the shell, and the case-shot. The hollow shot containing explosives is the more destructive.

Prometheus (*prō-mē'thūs*), a hero of Grecian mythology, who, on account of various services rendered to men, was chained by Zeus to a rock, where a vulture was sent to devour his liver by day, Zeus causing it to grow again by night. As Prometheus continued to endure this torture without yielding, the wrath of Jupiter was at length appeased, and the victim was released. Some legends represent the offense of Prometheus as stealing fire from heaven for the benefit of men; and in the tragedy of Æschylus he is an immortal god, a friend of the human race, who does not shrink from opposing the evil designs of Zeus against mankind nor even from sacrificing himself for their salvation. The possession of fire was very important to the early races of men, and the legend of its having been originally stolen from heaven is very widely spread over the world.

Proof'-Read'ing. Owing to the varieties of handwriting which are submitted to printers, as well as to various accidents which cannot wholly be avoided in setting up type, it is necessary that the first imprints or proofs of a book or periodical should be carefully revised and corrected Moreover, an author or editor is by this means enabled to make alterations or corrections in the text to the last moment. Among the errors for which proof-readers will be on the alert are these: the omission of letters or their wrongful insertion; bad spacing between words or letters; the omission of words; the transposition of letters, words or phrases; wrong type; defective punctuation and use of capitals; crookedness of lines. For these faults the proof-reader uses certain appropriate marks. It is not, however, necessary to adhere to these marks alone. Every proof-reader should, however, make his corrections in the margin and on the side nearest the error. He should set a vertical stroke at the end of each correction in the margin. The spot at which the correction is to be made should also be indicated. The purpose of the vertical stroke after each marginal correction is to separate one correction from another, for it is not uncommon to find several fall close together, even in the one line. Thus a wrong letter would be corrected by a stroke through it, the right letter written in the margin, and a vertical stroke after this letter A caret is used where something is to be inserted; a mark like a d where something is to be deleted or omitted. Proof-reading must be done with attention to the form rather than the meaning, except where the editor or author may wish to make alterations in the meaning rather than to correct the form. It is difficult and unsafe to attempt to combine both purposes in a single reading. In general, even the form requires three readings, preferably by at least two different persons.

Prop'aga'tion, as a natural process among wild plants, is accomplished by the various methods of scattering spores (*q. v.*) and seeds (see SEED-DISPERSAL), through parts of plants, as buds and twigs, breaking off and taking root or even by the entire plant being carried by the wind, as such "tumble-weeds" as the Russian thistle and pigweed. Other means of propagation are runners and branches that take root at their joints or tips, as the strawberry and raspberry Many plants spread only too effectively through shoots sent up by their roots and underground stems, as the silver-leaf poplar and Canadian thistle. But in the horticultural sense propagation refers to a group of artificial processes, as budding, grafting and layering (see these headings), the planting of seeds, bulbs, tubers, cuttings etc. or the transplanting of young plants (see HOT-BED). The reproduction of plants by other means than from the seed is spoken of as vegetative propagation, and is used to keep some desirable characteristic that will not breed "true" in seedlings, as in fruit-trees. (See GRAFTING.) For the manner in which new varieties are produced see PLANT-BREEDING.

Prosenchyma (*prŏs-ĕn̠'kĭ-mȧ*) (in plants), a tissue in plants whose cells are elongated or fibrous. It is a general name covering all elongated and fiber-like cells, as distinct from parenchyma, which is a tissue composed of cells whose three diameters are approximately the same.

Proserpina (*prô-sĕr'pĭ-nȧ*), daughter of Zeus and Demeter. While gathering flowers on the plains of Sicily, she was abducted by Pluto and taken to his abode in the underworld, where she was found by her mother after a nine-years' search, and given up by Pluto only on condition that she live underground for part of the year. The myth clearly is an expression of the revival of nature every year, after winter is over.

Protagoras (*prô-tăg'ô-rȧs*), the earliest of the Greek sophists, was a native of Abdera, born about 481 B. C. The basis of his philosophy is the proposition that "man is the measure of all things." All his works are lost, and he himself perished at sea (*c.* 411) while on his way to Sicily to escape a charge of atheism brought against him at Athens.

Protandry (*prô-tăn'drĭ*), (in plants), a condition in which the stamens are mature and shedding pollen before the stigma of the same flower is ready to receive it. See POLLINATION.

Protec'tion is the aid given by government to particular industries by bounties by taxation of other industries or, more commonly, by tariff or import-duties on foreign products. See POLITICAL ECONOMY.

Protec'tor, a title which has sometimes been conferred on the regent or governor of the kingdom during the minority of the sovereign. Oliver Cromwell in 1653 took the title of lord-protector of the commonwealth of England, Scotland and Ireland, and ruled under that title until his death.

Pro'teids, a large group of organic compounds found in animals and plants. They form the chief constituents of blood, muscle, nerves, glands and other organs of animals, and play an important part in plant-life. Although much work has been done in attempting to learn their exact chemical constitution, little definite is yet known. They are amorphous, and contain about 54 parts carbon, 7 hydrogen, 16 nitrogen, 21 oxygen and from 1 to 1½ sulphur. They differ widely in solubility and in their decomposition-products. Food-stuffs have been divided into two divisions: heat-producing and tissue-forming, the amyloids and fats constituting the former and proteids the latter division. This, however, is very misleading it it implies that the oxidation of proteids does not develop heat and that amyloids and fats subserve only the production of heat. Proteids are tissue-formers, but they also are heat-producers because they are competent by chemical metamorphosis in the body to give rise to amyloids. The following is one of the several classifications that have been made of proteids:

I. Albumens, soluble in water: 1. Serum; albumen; 2. Egg albumen.

II. Globulins, insoluble in water, soluble in very dilute acids and alkalies, soluble in dilute solutions of sodic chloride and other neutral salts: 1. Myosin; 2. Globulin; 3. Fibrinogen; 4. Vitellin.

III. Derived albumens, insoluble in water and solutions of sodic chloride, soluble in dilute acids and alkalies; 1. Acid albumen; 2. Alkali albumen or albuminate casein.

IV. Fibrin, insoluble in water, sparingly soluble in dilute acids and alkalies and in neutral saline solutions.

V. Coagulated albuminoids,

VI. Amyloid substance or lardacein.

VII. Peptones, produced by action of the gastric juice on all albuminoids.

Prot'estantism, a term derived from the *protest* of Luther and his adherents against the decree passed by the Roman Catholic states at the second Diet of Speier, in 1529. The principles involved in this protest were that the Roman church has no authority over the Reformed church, that the authority of the Bible is supreme and above that of bishops and councils and that it is to be interpreted, not according to tradition, but by its own language. The right of private judgment in reference to the interpretation of the Scriptures is the principle of Protestantism that especially distinguishes it from Roman Catholicism. Protestant churches are divided into numerous branches, with wide differences of doctrine and forms of worship, but all agree in the assertion of independence from the Roman see.

Proteus (*prō'tē-ŭs* or *prō'tūs*), in the oldest Greek mythology, appears as an old man of the sea who tends the seal-flocks of Neptune, his father and is endued with the gift of prophecy. His favorite residence, according to Homer, is the island of Pharos, near the mouth of the Nile. Here he rises at midday from the floods, and sleeps in the shadow of the rocky shores, surrounded by the monsters of the deep. But when caught by persons who sought to have him foretell future events, he would try to escape by assuming all manner of ugly shapes and disguises, and would refuse to exercise his gift until he found that further resistance would be useless.

Prothallium (*prô-thăl'lĭ-ŭm*), among plants, is a name applied in a general way to the gametophytes of *Pteridophytes* and *Spermatophytes.* It specially belongs, however, to the ferns, in which the prothallium, often written prothallus, is a quite distinct but very small green and notched thallus. Upon the under side of this small body the antheridia and archegonia occur. From the fertilized egg within the archegonium the ordinary leafy fern-plant arises. When in other plant-groups the prothallium ceases to be independent, as in seed-plants, it often retains the name. For example, many would speak of the female gametophyte (endosperm) found in seeds as a female prothallium. See GAMETOPHYTE.

Proth'ero, George Walter, English historian, was born in Wiltshire, Oct. 14, 1848, and educated at Eton, Cambridge and the University of Bonn. From 1876 to 1894 he was tutor and university lecturer at Cambridge, after which, for five years, he was professor of history at Edinburgh University. In 1899 he succeeded his brother as editor of *The London Quarterly Review.* His published work embraces *The Life of Simon de Monfort; Memoir of Henry Bradshaw;* and *The British History Reader.* Rowland Edmund Prothero, besides editing *The Quarterly*, has published *The Life of Dean Stanley*, besides editing the latter's *Letters*, *Letters of Edward Gibbon*, *Letters of Byron* and *Letters of Richard Ford.* He has also written a *Life of Queen Victoria*, a memoir of *Prince Henry of Battenburg*, *The Psalms in Human Life* and *Pioneers of English Farming.*

Protococcus (*prō′tō-kŏk′kŭs*), a genus of plants which are among the simplest of the green algæ. The mature plants are single, spherical, green cells, which occur in masses. See CHLOROPHYCEÆ.

Protogyny (*prō-tŏj′ĭ′nĭ*) (in plants). a condition in which the stigma is ready to receive before the pollen of the same flower is ready for shedding. See POLLINATION.

Protonema (*prō′tō-nē′ma*) (in plants). When the asexual spores of mosses germinate, they at first produce green, branching filaments, which are prostrate and resemble ordinary green algæ. Upon this filamentous body the ordinary leafy branches arise. This algæ-like body is known as the protonema. See MUSCI.

Protoplasm (*prō′tō-plaz′m*), the living substance in animals and plants. Huxley called it the "physical basis of life." It is the only substance endowed with life. It is very similar in animals and plants, and within it all living activities take place. It is a jelly-like, colorless substance, appearing finely granular under the microscope. It is composed of two parts: one more solid, which stains deeply with dyes (*chromatin*), and a fluid part (*achromatin*), which stains very faintly or not at all. The discovery of protoplasm and the gradual appreciation of the part it plays in the living world were among the greatest scientific advancements of the nineteenth century. In 1835 Dujardin, a French naturalist, was studying the simplest animals (*Protozoa*) under the microscope. He observed that their bodies were composed of a sort of transparent jelly, that moved and contracted and showed evidences of being alive. This soft, jelly-like substance he called *Sarcode*, and described it as living matter endowed with life. In 1846 Hugo von Mohl, a botanist, called attention to the viscid contents of plant-cells, for which he proposed the name *protoplasm*. This name had been used in 1840 by Purkinje for animal substance, but Von Mohl first brought it into general use. Presently naturalists began to suspect that the *sarcode* of the zoologists and the *protoplasm* of the botanists are essentially identical in nature. This was definitely maintained by Cohn in 1850. In 1860 Max Schultze placed the matter on a secure basis, and applied the term protoplasm to all living substance, either animal or vegetable. This led to what is known as the protoplasm-theory, which absorbed the cell-theory of Schleiden and Schwann. By Max Schultze the cell was defined as a mass of protoplasm surrounding a nucleus. Although protoplasm is so similar in appearance and reactions in all living beings, nevertheless, there must be unperceived differences — possibly not of kind but of degree of modification. See CELL-DOCTRINE.

Protozoa (*prō′tō-zō′ȧ*), the simplest animals. Collectively, they form the subkingdom of protozoa. They are microscopic and unicellular, and abound in stagnant water. They are of great interest to zoologists and physiologists, because in them the processes of life are reduced to their simplest expression. By studying them many facts are obtained that help in understanding the more complex animals. They have recently been studied in reference to their reactions to stimuli, and many important results obtained. The daily life of a protozoön was made the subject of study in one of our laboratories of physiology. The group includes simple forms like the amœba and its relatives, having root-like feet and constituting the class of *Rhizopoda*. Many of the rhizopods have no covering, but others either secrete a shell or gather hard particles and build one Chalk is largely made of minute, limy shells of protozoa. The form most common in chalk is a cluster of globular chambers. varying in size. The walls of these shells are perforated by minute holes, through which the soft protoplasm of the animal protrudes. They constitute an order called foraminifera or hole-borers. These animals are abundant in warm and temperate seas. They live near the surface and, as they die, their shells sink and reach the bottom. Deep-sea explorations have brought from great depths a soft ooze, formed almost entirely of these shells of foraminifera. Somewhat similar forms make shells of great beauty, of quartz or silica, which cannot be dissolved by acid or melted by fire. They constitute the order of *Radiolaria*. The higher protozoa belong mainly to the class of *Infusoria* (which see). These minute animals have hair-like processes (*cilia*), which propel the body through the water like the action of many small oars. In some forms the hair-like threads are large, reduced in number to one or two and called flagella. Thus the class of infusoria is separated into the two divisions of the *Flagellata* and the *Ciliata*. The latter contains the highest developed of the protozoa. Among the more common forms may be noted the slipper-animalcule (*Paramœcium*), with a free-swimming, slipper-shaped body; the bell-animalcule (*Vorticella*), with a bell-shaped body anchored by a stalk; and the trumpet-animalcule or stentor. The rhizopoda and the infusoria are the chief classes; two others of less importance are recognized. See Leidy's *Freshwater Rhizopods of North America*, beautifully illustrated, published by the United States government; and Kent's *Manual of the Infusoria*.

Provençal (*prō′vŏn′sal′*) **Language, The,** is one of the so-called Romanic languages, all of which are descended from the language of ancient Rome. Wherever Romans law, custom and trade established themselves, the language followed. In this way the inhabitants of northern Italy, Spain, France (Gaul) and parts of Switzerland received a new tongue. The language which came into common use in these places, however, was the low Latin of the provinces, a colloquial form of Latin, lacking much of its grammatical precision. This low Latin, mingling with the languages or dialects of various places, produced, in time, a number of new languages having the same background but little else in common. Writers distinguish six such Romanic languages: Italian, Moldavian, Spanish, Portuguese, French and Provençal, the latter a dialectic language of the south of France, whose use extended from Lake Geneva to the Bay of Biscay and to the Mediterranean. This section of France had not only a language of its own but a literature, which in the 12th and 13th centuries was especially rich in poetry. It was in this language the songs of the troubadours were mostly composed, so that Provençal and troubadour are often used as synonymous terms. The conquest of southern France by northern France in the 13th century, reduced the old Provençal tongue to the level of a mere dialect; nevertheless, its effect upon the language which has superseded it is marked, and the relation of the two affords a battleground for modern philologists. In the poems of Mistral, however, Provençal still is a living language.

Prov'erbs are very hard to define; but nearly everybody knows one when he sees or hears it. Perhaps the best description is that of Cipriano de Valera: "Proverbs are short sayings, sententious and true, and long since accepted as such by common consent." The distinctive characteristic of the proverb is that it is a popular current saying, adopted as a convenience by the community. It must indeed have shortness, sense, salt, pith and other qualities, but it also is necessary that these should be so combined that it will strike the popular fancy and thereby come into general use. It has been well-said that no one man ever made a proverb. It has equally well been said that "the proverb is the wisdom of many and the wit of one." He may have made an original saying, but the proverb is a creature of popular suffrage. Not only is this the case, but they pass from one nation to another and become the property of the race; and for this reason it is impossible to determine even the nationality of some of our best and most popular proverbs. The office of the proverb is to "hit the nail on the head," to "put the matter in a nutshell," to speak the last word, to settle the issue without further argument or discussion. Of all national groups of proverbs the Spanish contains the greatest number, 25,000 or 30,000; and they are as racy as numerous. Among oriental proverbs the Arabic ones hold the first place in quantity and perhaps also in quality, but the Persian and Hindustani proverbs also are excellent, and in the Turkish there sometimes is a vein of poetry that is very striking. It is a question whether the tender beauty of our proverb: "God tempers the wind to the shorn lamb" is not rivaled by its Turkish parallel: "God makes a nest for the blind bird."

Prov'idence, R. I., a seaport and capital of Rhode Island. It is the second city of New England in wealth and population, and is an important center for manufacturing and shipping and for its railroad and financial interests. It is celebrated for its manufacture of jewelry and silverware. It also produces tools, stoves, engines, locomotives, cottons, woolens, corset-laces, shoe-laces, lampwicks etc., and has many bleaching-works. It is situated at the head of navigation on an arm of Narragansett Bay (called Providence River), 35 miles from the Atlantic and 44 from Boston. Among the many notable public buildings and institutions are a city-hall of granite, costing $1,000,000, with the state soldiers' monument facing it; the state-house, custom-house and postoffice; the Athenæum; the buildings of the Rhode Island Historical Society; the Arcade and Butler Exchange; a great number of churches, schools, libraries, hospitals and asylums, including a noble charity known as Dexter Asylum for the poor; the Quaker College, and Brown University (*q. v.*). Providence was settled in 1636 by Roger Williams. Population **250,000.**

Prunes are the dried fruit of a certain variety of plum-trees, largely prepared in France and exported from that country Considerable quantities also come from Bosnia, Servia and California.

Prun'ing, the removal of branches from trees and shrubs to add to their health, increase their production of fruit or render them more ornamental. Forest-trees are sometimes pruned to increase the size of the trunk for timber purposes. In pruning it is necessary to understand the particular nature of the tree or shrub to be pruned, but it may be laid down as a general rule that the branches cut off should be small in proportion to the size of the trunk. The proper season must be known, pruning for some trees can be done only in the resting season, of others in the time of full growth The cut should be smooth, care being taken that the wound shall heal rapidly. Large cuts must be covered with a preservative.

Prussia (*prŭsh'ȧ*), the largest and most important state of the German Republic, is bounded on the north by the North Sea, Denmark, and the Baltic Sea, on the west by Holland, Belgium, Luxemburg, and France, on the south by Bavaria, Saxony, and Czecho-slovakia, and on the east by Poland. East Prussia is detached by Polish corridor to Danzig. The total area is 103,384 square miles, with a population of 35,000,000; that is, nearly two thirds of the German Empire in territory with about three fifths of the population. The frontier has a circumference of 4,720 miles. About one fifth of the present area has been acquired since 1853, the largest gains being made after the victorious war of 1866. The greater part of Prussia belongs to the northern plain of Europe, while less than a third chiefly in the southwest, can be described as hilly or mountainous. The northern plain is watered by five large rivers — the Niemen, Vistula, Oder, Elbe and Weser — all of which rise beyond the borders of the kingdom, and also by the Pregel, Eider and Ems, which are wholly Prussian. In the west the chief river is the Rhine, which enters Prussia at Mainz (Mayence), and thence flows north through a narrow valley; it is navigable throughout its entire course in Prussia. The capital of Prussia and also of the German Republic is Berlin (population 3,250,000). The other chief towns of Prussia are Breslau (550,891), Cologne or Köln (545,167) Frankfort-on-the-Main (430,598), Hannover (325,384) and Magdeburg (300,685).

Education is compulsory between six and 14, its management and direction being under the control of the state. Prussia has ten universities, Königsberg, Berlin, Greifswald, Breslau, Halle, Göttingen, Münster, Bonn, Kiel and Marburg, which number 1,698 professors and 20,785 students. In addition to the libraries of the universities, there is the Royal Library at Berlin. with 1,000,000 volumes and 20,000 manuscripts. Among the numerous scientific and literary schools and societies are the Academy of Arts, the Royal Museum of Arts, the Academy of Sciences and others.

The name Prussia was originally only that of a dukedom covering the territory now know as East Prussia but was expanded in 1701 into the "Kingdom of Prussia" to cover all of the territory ruled by Frederick III of Brandenburg. His son, Frederick I, developed the army into the weapon which Frederick II, called the Great, still further perfected and employed in the career of shameless conquest and aggression which later became the domnating policy not only of Prussia but of the German Empire and which led to the World War of 1914. The establishment of Prussia's dominating influence in the German Empire was largely the work of Bismarck (*q. v.*) who, in furtherence of his purpose, brought on war with Austria in 1866 and with France in 1870. *See* **World War.**

Pruth, an affluent of the Danube, rises in Austrian Galicia on the northeastern side of the Carpathian Mountains, and flows eastward past Kolomea and Czernowitz. Length about 720 miles.

Pseudonym (*sū'dō-nĭm* (Greek *pseudos*, false, and *onoma*, name), a false or assumed name adopted by an author, which conceals his identity. In recent times young authors especially have frequently risked the publication of their first work under a pseudonym — otherwise called *nom de plume* or pen-name — and have kept it up afterwards, and this to such an extent that the real name of the author in some cases is almost unknown to the general public. For instance, the name of *George Eliot* is familiar to book-readers on both sides of the Atlantic; but few would recognize a work by Marian Evans, her maiden name. Among the famous pseudonyms of the 19th century we may mention *Currer Bell*, Charlotte Bronté; *Hosea Biglow*, James R. Lowell; *Bystander*, Goldwin Smith; *Boz*, Charles Dickens; *Pisistratus Caxton*, 1st Lord Lytton; *Grace Greenwood*, Mrs. Lippincott; *H. H.*, Helen Hunt Jackson; *Gail Hamilton*, Mary Abigail Dodge; *Marion Harland*, Mrs. M. V. Terhune; *Orpheus C. Ker*, R. H. Newell; *Owen Meredith*, Earl of Lytton; *Petroleum V. Nasby*, D. R. Locke; *Ouida*, Louise de la Ramée; *George Sand*, Madame Dudevant; *Timothy Titcomb*, J. G. Holland; *Mark Twain*, Samuel L. Clemens; *Josh Billings*, Henry W. Shaw; *Uncle Remus*, Joel Chandler Harris; *Artemus Ward*, Charles F. Brown.

Psyche (*sī'kē*). According to Grecian mythology, Psyche was the youngest daughter of a king and so lovely that she aroused the jealousy of Venus, who sent Cupid to the maiden to inspire her with love for the basest of men; but Cupid himself was so impressed with her charms that he at once loved her, and desired to make her his own. As she reciprocated his passion he visited her every night, earnestly requesting her not to inquire or seek to know who he was. But her jealous sisters, working upon her fears and her inquisitiveness as well, represented to her that she was embracing a monster in the darkness of the night. To satisfy herself she lighted a lamp while Cupid was asleep, when to her great delight she saw that her lover was the handsomest of gods. In her excitement, however, she let a drop of hot oil fall on his shoulder, when he arose, and after upbraiding her for her doubts forsook her. After wandering about for some time, she came to the palace of Venus, when she was seized by the goddess and kept as a slave. Cupid, however, still loved her, and after a time was united to her in immortal wedlock. The story is considered by all critics to be a beautiful representation of the progress of the soul through earthly passion and misfortune to eternal peace and joy.

Psychology (*sī-kŏl'ō-jy*) (Greek *psychos*, soul, and *logos*, discourse), the science of mind or, in more general terms, of man's immaterial nature. The dividing line between mind and matter cannot be definitely drawn, because neither can be accurately defined; but our reason plainly teaches that there is a fundamental difference, notwithstanding the intimate relation each sustains to the other. To escape the difficulty of distinguishing properly between mind and matter, one school of extremists, whose chief apostle was famous Bishop Berkeley, maintains that mind is the only reality in the universe and that all external or visible objects at most are but expressions or manifestations of mental states. Another school, much more numerous, regard all mental acts and states as mere qualities of matter or, at most, as mere results of the *force* with which matter has been endowed. Thought, feeling, volition, this school tells us, are the product or output of man's brain and physical organization, as a flame of heat is the output of a fire or as rays of light are the output of the sun, under all the physical conditions to which it is subject. It ought to be a sufficient answer to both these schools, that we are conscious of living both in a material realm and in one that is not material; we know that there is an external world, and we also know — to use the language of Scripture — that there is a spirit in man; we know that we have bodies made of flesh and bone and blood, and we also know that we have a *being* that is not flesh or bone or blood; we know that we have "senses, affections, passions;" and we know, too, that we have qualities within us that unite us to the unseen and the eternal. "I am a spirit inhabiting a body."

The division of the mental faculties which is now generally accepted is threefold; the intellect; the sensibilities or emotions; and the will. Under each of these are numerous subdivisions. Of late years the science of psychology or mental philosophy has received a large measure of attention; not only in schools and colleges, but from the general public; and we can only refer the reader to the various essays and textbooks — their name is legion — that have been written and published on the subject. See *Elementary Psychology* by Sorley and Höffding's *Outlines of Psychology*.

Psychology for Teachers. The great movement for the professional training of teachers in the latter part of the 19th century was based on the idea that back of education lies a method that can be understood only by those who are versed in psychology. Educational reformers have for nearly three centuries been placing some emphasis on this idea, but only recently can it be said to have become a moving force with a large number of the rank and file among the teachers. During the last 20 years, however, the belief came to be very generally entertained that psychology, especially physiological and experimental psychology and child-study would revolutionize education. The new education based on these was, in contrast with the old education, to be authoritative and scientific. Perhaps the most notable advocate of this view is President G. Stanley Hall. On the other hand, many psychologists, especially Professors James and Münsterberg, maintain that these hopes are extravagant and that the new psychology, based on physiology and experiment, so far from being likely to revolutionize education, has even less to offer for the guidance of the teacher than the old psychology. Moreover, they regard a knowledge of the old psychology, as, although possibly helpful, by no means indispensable.

In the development of psychology the original movement toward the utilization of mathematics, experiment and scientific methods generally is due to Herbart. To him the most important application of psychology was to education. He founded the positive part of his educational practice on a psychology that did not differ in method essentially from the old except in an untenable employment of mathematics. To careful observation he looked for the discovery of individual differences and abnormalities that hinder the success of that method of teaching which for the average student is psychologically sound.

It must be confessed that physiological and experimental psychology and even child-study have so far not given to education much that is of such specific application as to make it a science like engineering. In a general way, however, the new psychology and, especially, its spirit of scientific criticism and method have modified and are modifying the attitude and method of teachers in a way that promises to be revolutionary. Moreover, we are learning what we may hope for from psychology. That the study of children will reveal what to teach we have come to doubt. The end of education is no longer thought to be merely general mental discipline or "harmonious development of all the powers." It has come to be conceived as efficiency or adjustment to the conditions of life. Though psychology can reveal the powers of the mind and the laws of their development, it can not show the social and industrial conditions with which these powers should be prepared to deal. But when once we have settled what should be taught, we may look to the psychologist to tell us the proper order and method of presenting it.

Among the most important effects of general psychology upon education may be mentioned the inductive method, involving the method of development (compare TEACHING, METHOD OF) and the recognition of the importance of interest (*q. v.*) in schoolroom work. With this may be coupled the use of the analytic rather than the synthetic method in many subjects. The most important example of this is the word-method in teaching reading, according to which the child learns first to recognize the written or printed word and later analyzes it into letters. This is after the analogy of the learning of spoken language, where we begin with words rather than with phonic elements. The sentence-method goes one step further in beginning with whole sentences, later analyzing them into words and letters. So, too, in learning a language the analytic method endeavors to get the learner to use the language immediately and later to analyze out its grammatical principles and forms. All these are founded on the discovery that the child begins with a complex experience and later analyzes it. (See CHILD-STUDY.)

Psychology has led to a better comprehension of the laws of memorizing (*q. v.*) and of habit. It has emphasized the fact that learning is always through and for the sake of doing. Indeed, in the investigation of the motor-powers psychology has been especially helpful. The development of control over the body has been carefully studied. The sequence of random, spontaneous acts, experimental efforts, followed by the gradual elimination of such as are undesirable and the fixation of the rest as habitual responses to certain stimuli has been shown to be the regular sequence in developing skill of any sort. The general principle that larger fundamental muscles are brought under control before the smaller accessory ones and that, therefore, the muscles of the arm should be practiced before those of the fingers has been made clear. The importance of imitation, especially in the development of self-consciousness and the social and moral sense, has been traced out, and the effect of suggestion analyzed. The training of the mental powers has been shown to consist in storing the memory with useful material and the practice in its use, together with the formation of such habits as make for efficient thinking. Thus the conception of formal discipline has been discredited. (See MENTAL DISCIPLINE.)

Physiological psychology has done a little toward determining the laws of fatigue. More careful observation and experiment have shown the existence of wide individual differences among children and the consequent danger that class-teaching may fail to reach many. The importance of testing children for power and kind of memory, motor-ability, hearing and sight, capacity to attend, etc., has been shown. It has become evident that schools need the supervision both of medical and of psychological experts, that the unhealthy and the abnormal may be singled out for special treatment.

Finally, child-study has done much to determine the nature and order of development of the instincts to which teachers must appeal and the general history of physical and mental growth from infancy to manhood. See ADOLESCENCE, APPERCEPTION, ASSOCIATION OF IDEAS, CHILD-STUDY, FEELING, INTEREST, MEMORIZING, MENTAL DISCIPLINE, TEACHING, METHOD OF, and MODERN EDUCATION. Consult *Talks to Teachers on Psychology* by James; *Principles of Teaching* by Thorndike; *Fundamentals of Child-Study* by Kirkpatrick: and *The Educative Process* by Bagley.

Pteridophytes (*tĕr'ĭ-dŏf-ĭts*), one of the four great groups of plants, which includes the ferns, the scouring rushes or horsetails and club-mosses. The ferns are the most abundant and representative forms, containing about 4,000 species; the club-mosses are represented by a little over 400 species; but the horsetails only by 25 living species. The group as a whole is characterized by having a leafy and vascular sporophyte, in this way decidedly differing from the bryophytes (mosses) and resembling the spermatophytes (seed-plants). From the seed-plants the group differs in that its members do not produce seeds. The group as a whole is most extensively developed in the tropics, where especially the ferns and "little club-mosses" (*Selaginella*) are luxuriant both in forms and numbers. The three great divisions of pteridophytes differ exceedingly from one another in external appearance, but all are held together by important similarities. One of their important characteristics in common is the possession of a large, coiled and multiciliate sperm, very distinct from the simple, biciliate sperm of the bryophytes. See EQUISETALES, FILICALES and LYCOPODIALES.

Ptolemy (*tŏl'ē-mĭ*), **Clau'dius Ptolemæ'us,** an eminent mathematician and astronomer. He was born probably either in 70 or 77 A. D., and died at Alexandria in 147 A. D. As a mathematician he is especially to be remembered as having written the first treatise on trigonometry, a branch of mathematics invented by Hipparchus. In astronomy he wrote a complete treatment upon the entire subject as known in his time. This volume, *The Almagest*, remained a standard work until the time of Copernicus. Ptolemy assumed that the earth is spherical, is placed in the center of the spherical heavens and is a mere point compared with the distances of the fixed stars. As a geographer, Ptolemy was the first to point out the fact that the position of any point on the earth's surface can be accurately stated only after its longitude and latitude have been determined. In addition to these works he wrote a volume on optics, in which he stated the correct laws of reflection for plane surfaces and for concave mirrors as well as the law of refraction. Ptolemy must be considered as one of the earliest types of the modern scientific investigator.

Public Schools. See SCHOOLS.

Puck or **Robin Goodfellow,** an elf, a familiar figure in the fairy world of English folklore, immortalized by Shakespeare in *Midsummer Night's Dream.* The name really is a generic term for a fairy. Although the Pucks are noted for mischievous tricks, they sometimes perform kindly, domestic functions; are small and dwarf-like in appearance; and are easily propitiated by offerings of cream and kindly epithets. The name 'Puck' was adopted by an illustrated weekly published in New York.

Puebla (*pwā'blä*), an inland state of Mexico, and the name of the capital city of that State, is situated in one of the most elevated portions of that Republic. The state extends over an area of 12,992 square miles. Here rise the volcanic peaks of Popocatepetl, Iztaccihuatl and Orizaba. The fertile soil of Puebla is especially adapted to the cultivation of cereals, and of sugar, coffee, rice and cotton. There are valuable mineral deposits of copper, gold and silver contained in the state. The principal manufactures are cotton thread and cloth, beds, cigarettes, glass, cement, tiles and ornamental iron-work. In 1930 the population was 1,148,286.

The city of Puebla stands on a fruitful plain, about 7,000 miles above sea-level, sixty-five miles from the Federated District of Mexico. It was founded in 1531 and is to-day one of the most beautiful and picturesque cities in Mexico. From 1862-63, during the French occupation of Mexico, Puebla was besieged by the troops of Maximilian for two months. The city was taken by storm on May 17, 1863. To-day it is a thriving industrial city. The principal manufactures include cotton products, paper, leather goods, glass and porcelain. In 1930 the city had a population of 95,535.

Pueblo (*pwĕb'lō*), a city and the seat of Pueblo County, Colorado, is situated on the Arkansas River at the mouth of Fountain Creek, about 115 miles south by east of Denver. It is on the eastern slope of the Green Horn Range of the Rocky Mountains, in the famous Arkansas Valley, which comprises one of the largest single irrigated areas in the world, extending 250 miles from Royal Gorge to the Colorado-Kansas line. The city has the largest steel and iron producing plant west of the Mississippi River. Pueblo is an important railway center of the State. In the immediate vicinity are found valuable mineral deposits of gold, silver and zinc, which have greatly aided the rapid rise of Pueblo both in size and importance in the State of Colorado. Its chief industrial establishments include steel works, factories producing rails, nails, and bars, pipe foundries and blast furnaces. Numerous factories throughout the city produce confections, tents, brick, tile, fencing, saddlery, leather goods, canned products, extracts and baking powder. Pueblo has a commission form of government both for the city and the county. In 1930 the population was 50,096.

Pueblos (*pwĕb'lôs*), (Spanish *pueblo,* village), a tribe of American Indians in New Mexico and Arizona, dwelling in single habitations, which sometimes are large enough to contain a whole tribe. These buildings, which sometimes are five or six stories high and from 100 to 500 yards in length, are generally made of sun-dried brick. The ground-floor is always without doors or windows, entrance being effected by a ladder to the second story. Each family has a separate apartment, and there also are large rooms for general council chambers and for tribal dances. The Pueblos were first visited by Spaniards who explored this region in 1530. They have ever been skillful agriculturists and excelled in stock breeding. Under Roman Catholic missionaries, the Pueblos are making steady progress in education and civilization, although they have grafted upon their Christianity many of their old pagan beliefs and customs, to which they cling. The cliff dwellers doubtless were the ancestors of the Pueblos, ruins of their dwellings being seen in the cañons of the Rio Mancos, Rio Plata and San Juan Rivers in southwestern Colorado, New Mexico and Arizona. In these cliffs the strata of sandstone or limestone were separated by layers of soft clay which had worn away, leaving ledges of rock with caverns between. Upon these terraces are remains of clusters of dwellings, one ledge forming the floor and another the roof, the opening being faced so skillfully as to resemble the rock of the cliff. Some of these dwellings are now inaccessible. The marks of dangerous, doubling paths, hardly a foot wide, formerly used, can be seen on the cañon walls. San Juan cañon is shut in by walls of rock several thousand feet high, and one settlement is 1,000 feet above the Rio Mancos. Cliff villages or towns are found in the bottom-lands, with round stone towers near them.

Puerto Rico (*pwĕr'tō rē'kō*), the fourth largest of the Greater Antilles, and a possession of the United States, is an island situated between the Atlantic Ocean and Caribbean Sea, forty-five miles east of Santo Domingo, and forty miles west of St. Thomas. The island is ninety-five miles long and thirty-five miles wide, extending over an area of 3,435 square miles.

Surface and Drainage. In shape, Puerto Rico is almost a parallelogram, with a comparatively smooth coast line. The bays of Aguadilla and Mayaguez indent the western coast, and along the Southern coast are the ports of Guanica, Ponce, Guayanilla and Jobos. The entire surface of the island with the exception of coastal plains on north and south, is mountainous and hilly, with deep valleys, high plateaus, and precipitous canyons. Through the center of the length of the island, from east to west, is a range of mountains rising 1,500 to 3,750 feet, and cultivated to the summits. These are called Cordillera Central, Sierra de Cayey, or Sierra du Luquillo. On either side of this central range, between minor ridges and spurs, lie the fertile valleys. The soil of these valleys and of the seacoasts is extremely fertile. For almost four hundred years exhaustive crops have been taken from it without fertilizing it, and yet it is very productive. The mountains are of volcanic and sedimentary formation, and the coastal hills of thick white limestone. The lower lands along the northern coast are well watered, but irrigation is needed in the south. Rivers flow from the central mountain range, none of them navigable for any great distance, but all important sources of irrigation. The country is beautiful, with the varied and picturesque scenery, the cultivated and forested mountain slopes, the unusually beautiful and brilliant flowers.

Climate. The climate is the most healthful of the Western Hemisphere in the tropics, with an average annual temperature of seventy-six degrees Fahrenheit. The summer average is seventy-nine degrees and the winter average seventy-three degrees, as the climate is equable. There is abundant rainfall on the highlands and the coastal slopes of the north and east, but the opposite sides are often parched. There are occasional earthquakes and hurricanes.

Minerals. The mineral production of Puerto Rico is undeveloped, and almost unexplored, although it is known that there are extensive deposits of valuable ores. The manganese export in 1932 amounted to 2,865 tons. The natives wash gold out of the rivers by crude methods. There are small quantities of iron ore, silver, copper, lead, garnet, bismuth, tin, nickel and platinum. Phosphates are abundant, and there is much salt in the lagoons along the coast. Other mineral resources include brick and tile clays, building stone, lime, sand, cement rock, gypsum and paving blocks. Thermal and mineral springs are common, and at Aguas-Buenas, Lares, and Utuado are wonderful natural caves.

Production and Industry. Puerto Rico is largely an agricultural country. The chief exports are sugar, pineapples, oranges, grapefruit, tobacco and coffee. In 1932-33, sugar production amounted to 785,000 tons. The great hurricane of 1928 destroyed many of the coffee trees and coconut trees. In 1932, 518,008 pounds of coffee were exported to the United States; 9,950,587 pounds of tobacco unmanufactured; 76,266,000 cigars and 4,431,000 cigarettes. The cotton crop in 1931 amounted to 1,981 bales. Fruit exports to the United States are heavy in fresh and canned grapefruit, fresh and canned pineapples, and oranges. The exports in these fruits in 1932 were as follows: fresh grapefruit, 284,460 boxes, canned, 3,649,437 pounds; fresh pineapples, 576,489 crates, canned, 606,481 pounds; oranges, 19,798 boxes. The livestock industry is important. In 1930, there were 49,545 horses; 8,031 mules and asses; 310,514 cattle; 55,573 goats; 3,949 sheep; 103,689 swine; 684,448 chickens and 24,446 colonies of bees.

Transportation. In 1932, 3,364 vessels entered and cleared Puerto Rico from the United States and foreign countries. The chief ports are San Juan and Ponce. There are about 310 miles of railway almost encircling the Island and penetrating the interior. There are more than 1,080 miles of highway. A road improvement project to cost $1,000,000 made available by a special Congressional Relief Fund was under way in 1934.

Population. The population of Puerto Rico was 1,543,913 in 1930. This included 1,141,114 native whites; 397,156 Negroes; 5,605 foreign-born whites; and thirty-eight other races. In the Puerto Rican territory is also included the island of Vieques, thirteen miles east, which had 10,582 inhabitants, and the island of Culebra, between Puerto Rico and St. Thomas, which had 839 inhabitants in 1930. The chief cities, with their population in 1930, are the capital, San Juan, 114,715; Ponce, 87,604 and Mayaguez, 58,270.

Education. Education was made compulsory in 1899. In 1932, there were 1,997 schools with an enrollment of 229,169, in addition to an excellent system of night schools, kindergartens and private schools. Illiteracy is 44.1 per cent, and only about forty-four per cent of the children of school age are enrolled. The University of Puerto Rico, in Rio Piedras, seven miles distant, is co-educational, and had an enrollment of 1,700 in 1931. Both English and Spanish are spoken in the schools throughout the island.

Government. The name of Porto Rico was changed to Puerto Rico by Act of Congress on May 17, 1932. The Constitution is determined by the "Organic Act" of Congress in 1917, also called the "Jones Act." The government is representative. The executive power rests in a Governor appointed by the United States. The Congress consists of a Senate of nineteen members, and a House of thirty-nine Representatives. Five Senators and four Representatives are elected at large. Puerto Rico sends a Resident Commissioner to the United States, elected by the people for a four-year term. He represents his country in the National Congress. The Executive Council is composed of the heads of the seven departments.

History. Puerto Rico was discovered by Christopher Columbus in 1493. It was not settled until 1508, when Ponce de Leon founded the city of San Juan, and subdued the natives. The early Spanish settlers established an autocratic government, with such a rigorous forced labor system that the natives rapidly diminished, and negro slave labor was introduced in 1775. Between 1516 and 1798 many hostile expeditions had Puerto Rico as their goal. In 1535, and again in 1543, several small towns were destroyed by French privateers. Puerto Rico was the object of English attacks in 1565, 1572, 1595, 1597 and 1797. The greater part of San Juan was destroyed by the Dutch in 1625.

The white population of Puerto Rico, with the Spanish loyalists, was peaceful and not in favor of separation from Spain, to whom the country belonged for centuries. The revolts of 1820 and 1867 were not successful. In 1869 Puerto Rico became a Spanish province, and slavery was abolished in 1873. An autonomous government, granted in 1897, was not put into effect before the Spanish-American War. Naval forces attacked San Juan, and land forces occupied the island. As a result of the war, Puerto Rico was ceded to the United States by the Treaty of Paris on December 10, 1898. The military government which was at once established was superseded by the civil government prescribed in the Foraker Act of 1900. The authoritative positions were held by Americans appointed from Washington. The Jones Act of 1917 took the place of the Foraker and completed home rule.

The American occupation of Puerto Rico has provided pure water supplies and modern sewage disposal, eliminated yellow fever and smallpox, controlled the bubonic plague and campaigned against the hookworm. Juvenile courts have been established, workmen's compensation granted, prohibition adopted in 1917, and laws passed regulating employment of women and children. In 1921, there was considerable political agitation and the Unionist party led the attack against the Governor.

A severe hurricane on September 13, 1928 swept over the island. The dead numbered 245 and the injured 3,329, with 36,249 buildings destroyed and 18,957 families left without shelter of any kind. The property loss was more than $30,000,000, and the total crop loss $20,437,000. Congress appropriated $6,100,000 for relief of Puerto Rico in December, 1928, and $1,000,000 for relief, roads and bridges in June, 1930. The American Red Cross spent $3,188,303 in relief work in the island.

The appointment in January, 1934, of a new Governor of Puerto Rico has created a new interest in this island possession. President Roosevelt, in the summer of 1933, appointed Governor H. Gore of Florida, Governor of Puerto Rico. He fulfilled that appointment for only a short period. Soon after he reached San Juan and set about the duties of his office he became involved in political strife. This strife was furthered by his appointment of a Socialist as a trustee of the University of Puerto Rico. He was strongly censured for such action and open opposition occurred. So great did the opposition become that bombs were so placed as to endanger both his life and home. The Liberal leaders were incensed. All efforts to bring about an amicable settlement of the problem utterly failed. Governor Gore resigned from office in January, 1934, pleading "ill-health."

President Roosevelt appointed Major General Blanton Winship, U.S.A. (retired), of Macon, Georgia, to succeed Governor Gore. General Winship is well acquainted with the intricacies involved in the handling of colonial affairs. He entered the army service in 1898. He is a veteran of the Spanish-American War, the Philippine Insurrection, the Army of Cuban Pacification, the Army of Vera Cruz, and the World War. He served as adviser to the Governor-General of the Philippines from 1928 to 1931. In the latter year he became Judge Advocate General of the Army, an office which he retired from in 1933.

General Winship was inaugurated as the twelfth civil governor of Puerto Rico on February 5, immediately after his arrival in San Juan. The local officials greeted him cordially. The new governor was prepared to launch a program which gives promise of effecting much good for the Puerto Ricans. The keynote of this program was sounded in his inaugural message when Governor Winship declared that his intention was "to enhance the returns from insular agriculture so as to insure a better standard of living for all of the great majority of our people who are necessarily dependent upon that activity for their livelihood."

The political situation in Puerto Rico is decidedly interesting. The career of Mrs. Jean Springshead Whittemore of Kansas, who was recently appointed to the post of collector of customs at San Juan, is an interesting sidelight on the political affairs in Puerto Rico. She is the Democratic Committee-woman from Puerto Rico and the wife of the Puerto Rican Federal Land Bank director. Since 1924 Mrs. Whittemore has been a member of the faculty of the University of Puerto Rico and head of the English department at that institution. She had been a candidate for the governorship but received the appointment to the post of collector of customs at San Juan instead.

Americans as well as Puerto Ricans were delighted early in 1934 when Mrs. Eleanor Roosevelt, First Lady of the Land, added 6,638 miles to her flying record by an air journey to Puerto Rico. Thirteen days were spent in this, her most recent of travels, a journey from which she returned unfatigued and charmed with much of what she had witnessed on the island. She travelled unofficially on the regular airplane from Miami to the West Indies, and was greeted at every stop along the way by an admiring throng of officials, Girl Scouts and native children.

The journey was decidedly an informal one. In the fortnight spent on the island possession by Mrs. Roosevelt she caught a glimpse of all types of Puerto Rican life from such extremes as the properly tendered greetings of two Presidents of island republics to the benedictions of natives in calico and bandannas. Mrs. Roosevelt found the glimpses of native women taking their washing to the brooks, according to time-honored custom, very fascinating. She was always ready to stop and pass a friendly greeting to the thousands of children who lined up and waited patiently to see the First Lady.

The tropical scenery was especially appealing to Mrs. Roosevelt. With her never-failing sense of humor, she was heartily amused at the native trees called "women's tongues," because the seed-pods are perpetually rattling against one another, sounding like a group of gossips happily chattering. Much of her travelling on the island was done by motor car, thus enabling her to view the scenery and know the by-ways as well as the highways. She visited huts and hovels and banqueting halls. Not infrequently the midday meal was eaten in picnic fashion on a hilltop from which the surrounding country might be viewed.

Although Eleanor Roosevelt found much to entertain and amuse her on this journey, the trip was in reality undertaken with the intention of conducting a thorough investigation of working conditions on the island. With that intent, she knocked at the doors of rickety cottages with thatched roofs in the bamboo forests, and courteously requested to see the houses. She evinced no fear of the crowded alleys so prevalent on the island nor of the vile and sordid quarters which she entered. Social workers contributed much information upon living conditions in Puerto Rico and Mrs. Roosevelt enlarged upon this knowledge and information by her own tireless pursuit and interest in accumulating statistics. She was perhaps most interested in the undernourished children, of which there were crowds at almost every stopping place. Motorcycle police, native soldiery, mayors, and local reception committees all tried to aid and protect her, but she courteously yet firmly refused them, preferring to make her investigations in her own way. It is little wonder that Eleanor Roosevelt won so many admirers and friends since she was never irritated, never tired, never at a loss for tactful words with which to save any situation whatever. No other First Lady of our land has ever accomplished as much as Eleanor Roosevelt in establishing "good will" between our own and another land.

Puffballs, fleshy fungi related to the mushrooms, but in which the spores fully develop without being exposed.

See BASIDIOMYCETES.

Puget (*pū'jĕt*) **Sound,** a large inland sea in the northwestern part of the State of Washington, communicating with the Pacific by Admiralty Inlet and the Strait of Juan de Fuca. The Sound is 125 miles long and from five to twenty-five miles wide. It penetrates far into the interior, and is everywhere navigable for the largest vessels, which, in most cases, can ride close to the shores and load and unload without wharves. Great quantities of pine and fir are shipped from the region, which is rich in timber. Seattle, Tacoma, and Port Townsend are the principal cities on the Sound.

See SEATTLE; TACOMA; WASHINGTON.

Pulaski, a town and the seat of Pulaski County, Virginia, is situated on the Norfolk and Western railway, fifty miles southwest of Roanoke. It is in the center of a thriving agricultural and stock-raising district, which also has coal and iron mines. The town manufactures chiefly sulphuric acid. There are furniture factories, hosiery mills, chemical works, and iron and zinc furnaces. The town is frequented as a summer resort. From the surrounding region comes considerable trade in agricultural and livestock products. The population in 1930 was 7,168.

Pulaski, Casimir, a famous Polish soldier who fell in the American Revolutionary War, was born in Podolia, on March 4, 1748. On account of the active part he took in the Polish War against Russia he was stripped of his estates and outlawed in the partition of Poland in 1772. In 1777 he offered his services to the American colonies in their contest against England, and for his gallant conduct at the Battle of Brandywine was given a brigade of cavalry, which he commanded until March, 1778. In May, 1779, he entered Charleston at the head of Pulaski's Legion, a corps of lancers and light infantry which he had organized, and held it until the place was relieved. He afterward followed and harassed the British until they left South Carolina. At the siege of Savannah (1779), on the 9th of October, he fell in an assault at the head of the cavalry and died two days later.

Pulaski, Fort, a United States fort which was erected by the Government on Cockspur Island, was situated at the mouth of the Savannah River. It was built for the special defense of the city of Savannah, Georgia. The State troops of Georgia occupied this fort on January 3, 1861, and later turned it over to the Confederate Government. Port Royal was captured on November 7, 1861. General Q. A. Gillmore, chief engineer, then reported that Fort Pulaski, previously considered impregnable, could be captured by an attack from Tybee Island. In December, 1861, Tybee Island was taken possession of, and during February, additional guns, mortars and troops were landed on the island by night. On Jones Island and Bird Island batteries were constructed. After these preparations were all completed, a heavy fire was opened on Fort Pulaski on April 10, 1862. The next day the fire was renewed and extensive breaches were made in the walls of the fort. Late in the day, on April 11, 1862, the Confederate commander, Colonel Charles H. Olmsted, surrendered Fort Pulaski to the Union forces. General Gillmore took the fort, 385 prisoners and forty-eight guns. This battle is rather unique in that the Union forces who were besieging lost but one man, and only a few of the Confederate soldiers were wounded.

Pulitzer (*pū'lĭt-zẽr*) **Joseph,** a noted American journalist, was born in Budapest, Hungary, in 1847, the son of a Jewish father and Catholic mother. He immigrated to the United States in 1864. During the Civil War he served for the North in the 1st New York Cavalry. In 1865 he became a reporter for a German newspaper, the *Westliche Post,* in St. Louis. He acquired the St. Louis Dispatch and Evening Post in 1879, and the New York

World in 1883. When he died he gave the Columbia School of Journalism $1,000,000, and made other bequests, especially the fund establishing the Pulitzer Prizes for achievements in American arts and letters rewarded yearly in art, music, and literature, the latter including fiction, poetry, drama, history, biography, editorial, cartoon, and newspaper story. The prizes vary from $500 to $2,000.

Pul'ley, one of the mechanical powers much used in lifting stone and heavy timber. It consists of a wheel with a groove around its circumference, which revolves on an axis. The wheel, which is commonly called the *sheave*, is placed in a mortised block of wood, which is pierced by the axle of the sheave. The cord which passes over the sheave is called the *tackle*. The *fixed pulley* (Fig. 1) gives no mechanical advantage; it merely changes the direction in which the force is applied; thus W can be raised by merely pulling P down. The *single movable pulley* gives a mechanical advantage equal to two (Fig. 2); for, as the weight W is supported by two strings, the strain on each string is half of W; since, the strain on one being supported by the hook A, the power P has to support only the stress of the other string which passes around C. A still greater mechanical advantage is secured by a combination of pulleys, as shown in the second illustration. Theoretically, the larger the number of movable pulleys in any one combination, the greater is the mechanical advantage; but the enormous friction produced and the lack of perfect flexibility in ropes prevent any great increase in the number of pulleys. See Block and Tackle.

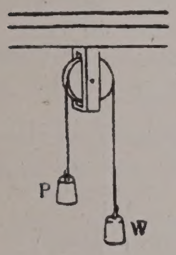


FIG. 1

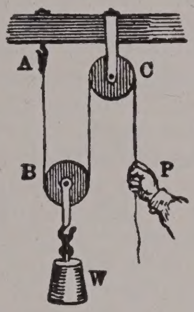


FIG. 2

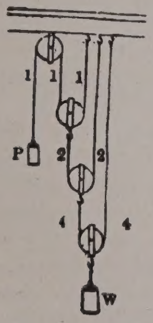


FIG. 3

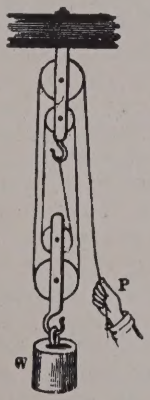


FIG. 4

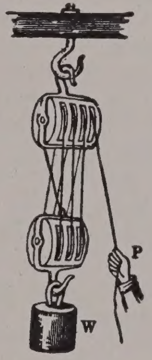


FIG. 5

Pull'man, George M., an American inventor and business man, was born at Brocton, Chautauqua County, N. Y., March 3, 1831. At 22 he engaged in moving buildings out of the way of the Erie Canal, then in process of widening. He made his home in Chicago in 1859, and in the same year he prepared models of sleeping cars, which became the foundation of his fortune. In 1863 he began building the coaches that are called by his name the world over. A few years later he organized the Pullman Palace Car Company which was to build them. In 1880 he founded Pullman, near Chicago, where the coaches were built. In 1887 he added the vestibule to his cars, which greatly increase their comfort. These carshops turn out $15,000,000 worth of railway carriages annually. He died in 1897.

Pulque (*pul'kȧ*), a favorite beverage of the Mexicans and of the inhabitants of Central America and some parts of South America, made from the fermented juice of the agave plant.

Pulse (Latin *pulsus*, a pushing or beating). The phenomenon known as pulsation is due to the distension of the arteries when blood is sent through them by the contraction of the heart. The pulse is usually examined at the radial artery at the wrist, the advantage of that position being that the artery is easily compressed against the bone. The frequency of the pulse varies with age, from 130 or 140 beats per minute in infancy to 70 or 75 in adult age.. It also varies somewhat with sex, adult females having six or eight more beats per minute than males. It is increased by exertion or excitement, and is diminished by lying down or sleeping. In some diseases the pulse may reach 150 to 200 beats per minute; and, on the other hand, in certain organic affections of the heart it may be as slow as 25 or 30.

Puma (*pu'mȧ*), a member of the cat family inhabiting the Americas from Canada to Patagonia. It goes under a variety of names in different parts of the country, as catamount, panther, American lion etc. It is about 40 inches long, without the tail, tawny in color above and soiled white below. Pumas are good climbers, but are not confined to wooded districts. They prey upon deer, antelope and other animals; near habitations they kill calves, pigs and sheep. See True's *Puma or American Lion* in the report of the United States National Museum for 1889.

Pum'ice (*pŭm'ĭs*), a light mineral, full of pores like a sponge, found near volcanoes. This highly porous and froth-like structure is due to the escape of vapors through the lava while it was in a state of fusion. It is much used for polishing wood, ivory, metals, glass, marble etc. Great quantities are exported from the Lipari Islands to all parts of Europe.

Pump, a machine for lifting water or other liquids to higher levels. The simplest form is the common suction-pump, which is shown in Figure 1. A is the barrel; B a pipe reaching into the water to be raised; C the spout; D a fixed valve opening upward only; E a movable valve opening upward only and carried in the bucket F, which is a hollow piece of wood or metal which, by leather or other packing, is made to fit in the barrel so closely that the water cannot pass between the bucket and the barrel; and G is the piston-rod which is operated by hand, steam, wind or other power and moves the bucket up and down in the barrel. The up-stroke of the piston at first lifts air, and, as the air cannot return past the air-tight bucket, a partial vacuum is produced in B. The external pressure of the atmosphere causes the water to ascend in B. By repeated strokes of the piston the air below E becomes exhausted and the water continues to ascend until the valve D is under water; thereafter the strokes of the pump lift the water above D and force it into the spout C.

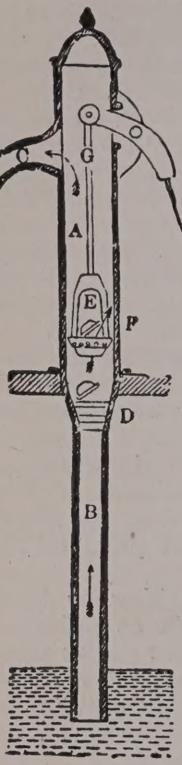


FIG. 1

The force-pump shown in Figure 2 is used to force water up into buildings. The piston is solid and the valve E, instead of being carried by the piston, is fitted in the discharge-pipe. When the piston is raised, the water rushes between the piston and the valve below and with the downward motion of the piston the water is forced past the valve E; it cannot return, and by repeated strokes the water may be forced to a considerable height. Force-pumps are used for deep wells and mines, hydraulic presses, steam and fire engines etc. There are other and more complicated forms of pumps, but all depend on the principles here explained. See Air-Pump.

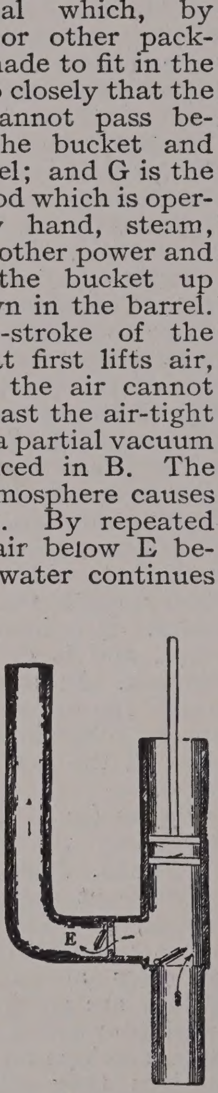


FIG. 2

Punch or the *London Charivari*, an English comic journal, is a weekly magazine of wit, humor and satire in prose and verse, copiously illustrated by sketches and caricatures. It draws its materials from the highest and lowest conditions of life, and, though stern in the exposure of sham and vice, is kindly in spirit when making merry over innocent foibles. The first number appeared in 1841, and under the joint editorship of Henry Mayhew and Mark Lemon it soon became a household word as well as an acknowledged power throughout England. It has done much to purify and elevate the standard of current wit in England. Sir F. C. Burnand, its editor for 25 years, retired in 1906.

Punch and Judy, the chief characters in a popular, comic puppet-show of Italian origin. It is generally ascribed to Silvio Tiorillo, an Italian comedian who flourished about 1600. The performance of the play requires only two persons, one to carry the theater and work the figures, the other to bear the box of puppets, blow the trumpet and sometimes keep up the dialogue with the hero of the piece.

Punc'tua'tion may be defined as the art of so dividing sentences or clauses with certain marks, as to make the sense more complete. Manutius, a Venetian printer of the 16th century, is generally regarded as the father of our present system of punctuation. Its principal marks are the period (.) generally placed at the end of a sentence and at the end of abbreviated words; the comma (,) used to separate words or pairs of words and, sometimes, clauses; the semicolon (;) used to separate clauses or divisions of a sentence requiring a more marked separation than is indicated by the comma; the colon (:) used where the sentences require a more marked separation than is indicated by the semicolon; the dash (—) sometimes performing the offices of the comma, the semicolon or the colon, but generally used to indicate a break in the thought or a change in the structure of a sentence; the interrogation point (?) used to denote a question; the exclamation point (!) used to express surprise or any special emotion; the hyphen(-) used between the divisions of a compound-word and to divide any word at the end of a line; the apostrophe (') used as a sign of the possessive case and to supply the place of any letter or letters omitted from a word; the parentheses or curves ( ) used to inclose any word or words essential to the meaning of the passage; the brackets [ ] used to include the words or remarks of the author within the writing of some other person; the quotation-marks, consisting of two inverted commas and two apostrophes (“ ”) used to inclose any word or words quoted from another person; the ellipsis (* * * * * *) or dots (. . . .), used to denote the omission of words from a quotation; the index (☞) used to point out any particular sentence or statement; the star or asterisk (*), the dagger (†), the double dagger (‡), the section (§), the parallel (‖), the paragraph (¶), which refer to notes at the bottom of the column or page or at the end of the article or chapter. There are numerous rules for the use of these various points, but perhaps no two writers or printers would agree as to the proper point to be used in all cases. Good judgment and taste and a certain amount of practice are essential to anyone who would punctuate in such a manner as to secure the fundamental object of punctuation — the expression of the sense.

To illustrate the aid that punctuation will sometimes render to an understanding of the sense of any composition, take the following example:

Every lady in the land
Has twenty nails on each hand
Five and twenty on hands and feet
This is true without deceit.

Now read the same properly punctuated:

Every lady in the land
Has twenty nails; on each hand
Five, and twenty on hands and feet;
This is true without deceit

To show how punctuation may sometimes vary the sense of any speaker or writer, the following example will serve: A member of the English house of commons called one of his fellow members a liar and was compelled publicly to apologize for the offense. He did so by rising in his place and meekly saying: "I said he was a liar, it is true; and I am sorry for it." The apology was deemed sufficient; but in the newspaper which published an account of the matter the next day, the apology was printed thus: "I said he was a liar; it is true, and I am sorry for it." See Proof-Reading.

Pu'nic Wars. This is the name commonly given to those contests which occurred between Rome and Carthage for the supremacy of the western world. The Romans called the Carthaginians *Punici*, in allusion to their Phœnician descent. The Romans never trusted their foes in the matter of their treaties, and so came to speak of Punic faith as synonymous with treachery. The wars between Rome and Carthage are under the names of these cities or are told in the biographies of the commanders engaged. The first Punic War broke out in 264 B. C.; the second in 218 B. C.; and the third in 149 B. C.

Pun'ishment. The methods by which society has dealt with those who break its regulations have in the course of history suffered radical changes. Four stages in this evolution may be noted. The earliest of these is that in which retaliation is the dominant motive. This method is illustrated by the ancient Hebrew law: "An eye for an eye and a tooth for a tooth." According to it, every injury committed by any individual was punished by inflicting a similar injury upon him, and justice required that these injuries should as nearly as possible be the same in character and amount. Psychologically this theory is founded on the instinct of revenge, and, like all instinctive acts, that of retaliation is adapted, though somewhat crudely, to an end — in this case that of terrifying the wrongdoer. Among civilized men, as among the brutes, the fear of wrath and revenge checks many an impulse to harm one's fellows. It will be noticed, however, that the instinct does not secure justice to the weak, whose revenge is not an object of dread; nor does it impose justice upon the powerful, who do not fear the anger of the weaker over whom they tyrannize. When, however, the state begins to interfere with private feuds and strengthen itself by administering equal justice to all, whether feeble or powerful, the limitations of the instinctive method of securing justice are to some extent removed. The notion that retaliation is the aim of punishment prevails long after the state has assumed the administration of justice. Eventually, however, the community comes to realize that retaliation is not the aim of public punishments, but rather the deterring of its members from committing similar offenses. Punishment does not need the broken law, nor does it compensate the injured party except when it takes the form of a fine for his benefit. It does, however, in a startling fashion reveal the probable consequences of crime, and this comes to be recognized as its true purpose. In punishment, for example, attention usually is not fixed on the welfare of the offender but, rather, on that of society. It is natural to suppose that the severer the penalty the more effective its influence in preventing crime. Blackstone cites 160 crimes that, according to the English law of his day, were punishable by death. In the latter part of the 18th century a movement for reform in the treatment of criminals began, led by John Howard (*q. v.*), the great philanthropist. As a result of this the penalties of many crimes became less severe and the treatment of those imprisoned far more humane. Society began to feel that there had been far too little charity in the treatment of criminals. The theory that punishment should be for the protection of society from the offender himself rather than to terrify prospective offenders by the spectacle of his wretched fate began to appear. Public executions, various forms of torture, the exposure of the bodies of executed malefactors, the pillory, the stocks, the whipping post — all gradually disappear. Instead, the criminal is kept imprisoned so that he will not harm others. Hard labor and confinement have replaced torture of all kinds. Care is taken to seclude the offender from society at large. It is fairly-well demonstrated that the deterring force of exemplary punishment has been vastly overrated. Indeed the criminal is often thus brought before the people to be regarded as a hero to be imitated. His sufferings are forgotten or idealized, his courage and cleverness only are remembered. Popular feelings are brutalized or rendered morbid by sensational crimes and spectacular punishments. We know now that it is far better to accustom men to think only of right conduct than to try to frighten them out of evil.

Finally, it has come to be recognized that the highest humanity demands not merely such consideration for the criminal as is consistent with the protection of society, but that this should include an attempt to reform him. Criminals of different degrees of degeneracy are separated. They are accustomed to labor and are taught trades, since lack of industry or of skill to get a living is a common source of crime. Reformation is encouraged by credits for good conduct, by which the term of imprisonment may be shortened, or by release on probation, both of which lead to the indeterminate sentence. In summary, we may say that punishment for retaliation, though it still appears in the conduct of individuals and mobs, has ceased to be a form of public justice. Punishment for example remains, but its value is not estimated as very high. The effort of criminologists is concentrated on measures likely to insure the protection of society and especially the reform of the criminal.

In the discipline of children the same principles and the same progress are exemplified. Many parents and teachers allow themselves to punish for revenge. Although this is instinctive, nothing can be more indefensible from the point of view of justice. To prevent it one should be careful about punishing while angry, the effect of the example on others should ordinarily not be the purpose of the punishment but, rather, incidental thereto. It must be said, however, that since children can not be secluded from society like criminals, the effect of example must certainly be reckoned with. This is especially true in the school. On the other hand, it certainly is better for the order of the schools and the conduct of the child to keep his attention away from wrong-doing, when possible. and, therefore from its punishment. Further. since society is in no great danger from the young, punishment for protection does not apply very considerably to them. Reform should be the fundamental motive in this discipline. While this fact has been recognized more or less clearly from time immemorial, the punishment of the child has been insensibly affected by the general method of dealing with offenders. Its severity was intensified by the religious doctrine of original sin and the total depravity of children. The idea that "to spare the rod is to spoil the child" was current for ages during which the schoolmaster was typically represented with a bundle of switches. Corporal punishment was the method of inducing the stupid and the idle to learn and of correcting the mischievous and the rebellious. The work of the school was so uninteresting that none save the extraordinary teacher could get the child to go through with it without compulsion, and the rod was the simplest resort. The development of general interest in childhood and in education (see CHILD-STUDY) and the reforms by which the curriculum has been enriched and school-work made more interesting (see INTEREST) have caused the discipline of the child to become more humane and rational. Comenius (1592-1670) taught that punishment should be for offenses against law and order and not as an incentive to study. To Rousseau (1712-1778) we owe the theory that every penalty should be the natural consequence of the offence. If a child neglects the suggestion of the parent not to put its fingers in the fire, let it be burned. In general, according to Rousseau, the disobedient child is allowed to do as he wishes until, having come to grief many times, he learns to respect the advice or commands of his elders. Annoying children are let alone, the natural social effect of their acts. This theory has been further elaborated by Herbert Spencer. It, perhaps, furnishes the best general rule to determine the character of punishment, for the penalties are such that the child as soon as it begins to reason will see their logical necessity. It fails where the natural consequences are too serious to leave the child to learn from them, or where its conduct is so annoying to others that arbitrary punishment becomes necessary. The theory of natural consequences gives no place to corporal punishment, unless it is for physical injuries wantonly inflicted. In general it may be said that education should teach children, to despise rather than fear physical pain; hence the limitation of corporal punishment. On the other hand, those who would entirely bar out this form of discipline, especially with very young or very unresponsive children, are probably extreme. To both classes it appeals as the natural penalty. See, also, MODERN EDUCATION and PRISONS. Consult Henderson's *Dependents, Defectives and Delinquents.*

Punjab (*pŭn-jäb′*) or **Panjab,** a province of India, occupying its northwestern corner, is watered by the Indus (*q. v.*) and its five great affluents — the Jhelum, Chenab, Ravi, Beas and Sutlej. The area under direct British administration (it was annexed by that power in 1849) is 97,209 square miles; that of native states under British control, 36,226 square miles, with a population of 4,424,398. Population in the entire province 24,754,737. The whole of the northern part is traversed by spurs from the Himalayas which inclose deep valleys; but in the south the surface is broken by no elevations, except the Salt range, varying from 2,000 to 5,000 feet in height. More than half the population are Mohammedans. The Punjab is the country of the Sikhs.

Pupa (*pū'pȧ*), plural **Pupæ** (*pū'pē*), stage between larva and adult in the metamorphosis of an insect. The pupa of butterflies is often called the chrysalis or chrysalid. Some insects pass the pupa-stage in silken cocoons; some undergo change in a case made of a variety of materials; others, in a rolled-up leaf. Pupæ do not eat; some have no power of motion whatever; others merely squirm when disturbed. See METAMORPHOSIS. Consult Cragin's *Our Insect Friends*.

Pure Food Law, an interstate commerce law passed by Congress, June 30, 1906. It defined the standard of purity for articles of food and drugs, and required that the exact ingredients be printed on the label. Much has also been done along the line of inspecting and safeguarding foods by state laws.

Pu'ritans, the name first given—according to Fuller in 1564, according to Strype in 1569—to those clergymen of the church of England who refused to conform to its liturgy and discipline as arranged by Archbishop Parker and his coadjutors. During the reigns of James I and Charles I the spirit of Puritanism continued to spread in English society and in Parliament, in spite of all efforts by the government to suppress it. The tyranny of Laud and the outrages of Charles on the English constitution led many who strictly were not Puritans to oppose both church and king for the sake of the national liberties. Before the war between Charles and Parliament broke out a considerable number of the Puritans emigrated to America, where they became the founders of the New England states, and practiced the form of religion to which they were attached. See Macaulay's *Essay on Milton*, also, PILGRIMS.

Pur'ple, Tyrian. See PHŒNICIA.

Pus'ey (*pū'zĭ*), **Edward Bou'verie,** a distinguished divine of the English church, was born at Pusey in Berkshire in 1800, and graduated with high honors at Oxford in 1822. In 1827 he was appointed professor of Hebrew at Oxford, a position he held until his death. Pusey, in connection with Keble and Newman, took a very active part in the Tractarian movement; and, in 1843 was suspended from preaching for three years on account of a sermon on the Holy Eucharist. But he did not follow Newman into the Roman church, preferring to remain in the Anglican communion and exerting all his talents and learning to sustain the evangelical doctrines and standards of life that were so dear to him; and in spite of all difficulties in his way he continued his labors to this end until the close of his life. In private life Pusey was a man of warm affection, and was widely known for his gentleness, sincerity and humility. His charity was limited only by his income; besides abundant gifts to the poor, he spent large sums in helping to provide churches in East London and in founding and supporting sisterhoods. He died at Oxford, Sept. 16, 1882. Consult *Life* by Canon Liddon. See KEBLE, MANNING and NEWMAN.

Put'nam, Israel, a general of the American Revolution, was born in what now is Danvers, Mass., Jan. 7, 1718. In 1739 he bought a farm near Pomfret, Conn., and devoted himself to its cultivation and to wool-growing. During the years he was engaged in this occupation a she-wolf committed considerable ravages upon his sheep and those of the neighborhood, and all efforts to capture or kill her were in vain until Putnam entered her den in a rocky cavern with a torch in one hand and a gun in the other, and shot her before she had time to spring upon him. Putnam distinguished himself in the French and Indian War, and at the breaking out of the Revolutionary War was placed at the head of the Connecticut troops. He was active and conspicuous at Bunker Hill, soon after which he was commissioned major-general in the Continental army; and in 1777 he was appointed to the defense of the Hudson River highlands. While at Peekskill, a lieutenant in a British regiment was captured as a spy and condemned to death; and when Sir Henry Clinton sent a message under a flag of truce, threatening reprisals if the sentence should be carried out, Putnam returned the following famous answer: "Headquarters, Aug. 7, 1777. Edmund Palmer, an officer in the enemy's service, was taken as a spy lurking within our lines; he has been tried as a spy, condemned as a spy and shall be hung as a spy, and the flag is ordered to depart immediately — Israel Putnam. P. S. He has accordingly been hung." In 1778 Putnam made his famous escape from Tryon's dragoons by riding down a steep declivity at Horseneck, Conn The next year he suffered a stroke of paralysis, and the remainder of his life was spent at home. He died at Brooklyn, Conn., May 19, 1790.

Putnam, Rufus, cousin of Israel Putnam, was born at Sutton, Mass., April 9, 1738, and served against the French from 1757 to 1760. In 1778 he helped his cousin to fortify West Point, and had command of a regiment afterwards until the close of the war, being made brigadier-general in 1783. He helped to found Marietta, O., in 1788, was made a judge of the supreme court of the Northwest Territory in 1789, and was surveyor-general of the United States from 1793 to 1803. He died at Marietta, May 4, 1824.

Put'ting the Shot consists in throwing heavy weights, and is one of the games that make up field-events in athletics. It is not so much mere throwing as pushing forward and up. The weight is called a shot, and varies from eight to twenty-four pounds. The contestant stands in a seven-foot circle, which he must not overstep, and the length of his throw is measured from the circumference to the place where the shot falls. The world-records are 38 feet, 2¾ inches with a 24-pound weight and 67 feet, 7 inches with the 8-pound shot.

Throwing the Hammer resembles shot-putting, and also belongs to field-events. The hammer is a 16-pound, round shot, the handle a chain four feet long with an attachment for holding. The contestant stands in a seven-foot circle, swings the hammer around himself repeatedly, and at last lets it go. The throw is measured from the circle to the spot where the hammer falls, and the record for this sport is 172 feet, 7½ inches.

Putrefac'tion is the decomposition of organic substances when accompanied by an offensive smell. It is now known to be the result of the activity of minute plants called bacteria, which also cause fermentation and many diseases. The spores of these plants are present in great numbers in the air and water and on the surface of the earth; but if we boil an infusion of organic matter, and, while the steam is coming freely off, close it in such a manner as to prevent any germs or spores from reaching the fluid, it will remain without any change for many years, but will begin to putrefy in a day or two if the plug be removed. Of the precise chemical changes that take place from the life of bacteria, we still are largely ignorant.

Puvis de Chavannes, Pierre (*pē-ār pü'vēs' dé shä'văn'*), a French painter, was born at Lyons in 1824. His teachers were Scheffer, Delacroix and Couture successively, but he was unable to yield himself to any artistic leading except his own instincts. The Salon refused his work nine times. It was only in 1861 that he first received recognition. As a wall-painter he recognized the limitations of wall-painting and submitted to the conditions. He held that fresco is merely the pleasant decoration of a surface. So he always remembered the relation of his designs to the building, and painted in flat tones of cool green, blue, brown or lilac. The pictures themselves were as much a part of the building as its walls. In America his best-known work is the decorations in the Boston library. Here he tried, he said, to symbolize its intellectual treasures. They represent the muses of inspiration hailing Apollo, and other compositions picture history, philosophy, poetry and science. Chavannes died at Paris in 1878.

Pygma'lion, in Greek mythology, grandson of Agenor, king of Cyprus, fell in love with an ivory statue of a young maiden he himself had made, and prayed to Aphrodite to give it life. His prayer being granted, he married the maiden, who bore him Paphus.

Pyle (*pīl*), **Howard,** an American artist and author, was born at Wilmington, Del., in 1853. His career began in New York City with contributions to periodicals. He chiefly delineated scenes of colonial life and medieval folk-lore. Some of the finest color-prints in *Harper* and *The Century* were from his drawings. Among his works are *Adventures of Robin Hood* and *Rejected of Men.* He died Nov. 9, 1911.

Pym, John, was born at Brymore, near Bridgewater, England, in 1584. Entering Parliament in 1621, he at once attached himself to the country party, and proceeded to war against monopolies, papistry and absolutism with a force and vigor that brought him three months' imprisonment. In the impeachment of Strafford and in all other proceedings of the Long Parliament, which assembled in 1641, Pym took a leading part, his power and ability being acknowledged by the Royalists in the derisive epithet of King Pym. He was one of the five members whom Charles I attempted to arrest in the chamber of the house of commons, thus precipitating the Civil War, which resulted in the defeat and execution of the king. He died at London, Dec. 8, 1643. He was buried in Westminster Abbey, but at the Restoration of Charles II his remains were cast into a pit in St. Margaret's Churchyard. See Goldwin Smith's *Three English Statesmen.*

Pyr'amids, The, of Egypt, were the sepulchers of the kings who reigned during the first twelve dynasties. They are on the left bank of the Nile between the desert and the cultivated land scattered from Abu Rash to Meidum. Their entrances all open to the north with one exception, and their sides face directly north, south, east and west. The size of the structure depended a great deal upon the length of the builder's reign. The pyramids are constructed of large, oblong blocks of stone about two feet six inches thick, placed in layers, each layer about one block's width smaller than the one below and advancing so to the summit. They usually were covered with a coping of stone which was so completely fitted and polished as to form a perfectly smooth surface to each side.

These royal tombs number about fifty or sixty of all sizes; but the best examples are the three great pyramids of Gizeh; they were built by the kings of the fourth dynasty and are the largest in the necropolis. The first or great pyramid was erected by

King Cheops, known as Suphis or Khufu (B. C. 3733–3700), and is the largest, being 484 feet in height and its side on the base-level measuring 760 feet. It covers over 13 acres or, as commonly compared, is "more than twice the extent of St. Peter's at Rome." The second, which is 707 feet high and measures 454 feet on a base-side, was built by Chepheren (Shafra) (B. C. 3666–3633). Its measurements are exactly half those of Chepheren which seems to have been done intentionally. It now is 354 feet high and has a base-side of 218 feet. Mycerinos has a coating of red granite from Syene while limestone was employed on the other two, a little of which still remains on the summit of the second.

In each is found the sepulchral chamber where the mummy of the king was placed; then a large slab of stone weighing 50 or 60 tons was cut and fitted into the entrance. So closely do these fit that explorers are often forced to break them or bore around. In the great pyramid the king's chamber is located well-up in the heart of the structure. It has five compartments, one large or main one where the mummy rested, and four successive chambers above, one placed above the other and separated by a slab of granite leveled and polished only on the undersurface. This group of rooms is connected with the outside by means of two air-channels and a long passage which leads downward for some distance and then re-ascends at an angle of 26° to the surface, piercing about 47 feet 6 inches from above the foundations. This channel that opens on the surface extends downward, beyond the meeting with the first, into the rock below the pyramid to a chamber called the well. A third chamber is found in the heart of the pyramid, about halfway between the bottom and the king's chamber, and is connected with it. This is known as the queen's chamber. These halls or passages are lined with polished granite and limestone, and show the marvelous ability and knowledge that the Egyptians possessed in supporting so great a superincumbent weight as is above these chambers and passages. In the great pyramid a V-shaped arch discharges the weight from off the king's chamber; and the top of the passage leading to it is heightened to about 28 feet for a great length, where the downward force is greatest, and the walls resemble inverted stairways and in this form come together at the top.

In the second pyramid the chamber is partly above and partly beneath the rock-foundation, while in the Mycerinos it is entirely below. A small chapel was always built near every pyramid, but in nearly every case it has perished.

Other pyramids of importance and of great dimensions are found at various other places in the necropolis. Many of the smaller pyramids were built by people of royal blood, while the wealthy buried their dead in what are called *mastabas* and differ from the pyramidal shape, oftentimes being cut into the solid rocks.

Architects and engineers have never solved the puzzle of the pyramids, though many theories have been put forth. Some it seems have come near to the truth in a numerical plan, but the astronomical theory apparently fails. James Ferguson says: "Nothing more perfect, mechanically, has ever been erected since that time."

Consult J. Ferguson: *History of Architecture;* Perrot and Chipiez: *History of Ancient Egyptian Art;* and Mathews: *The Story of Architecture.*

Pyr'amus and This'be, two lovers whose tragical history is told by Ovid in the 4th book of his *Metamorphoses.* They were natives of Babylon, and tenderly attached; but, as their parents would not consent to their marriage, they had to content themselves with secret interviews by night. On one occasion they arranged to meet at the tomb of Ninus, where Thisbe, who was first at the trysting spot, was startled to discover a lion. She immediately ran away but dropped her robe, which the fierce animal, that had just torn an ox in pieces, covered with blood. Soon after, Pyramus, appeared and, seeing Thisbe's robe, concluded she had been murdered and killed himself. When Thisbe returned soon after, and saw her lover lying dead on the ground, she immediately put an end to her own life.

Pyr'enees, the mountain chain that divides France from Spain. It stretches from the Mediterranean to the southeastern corner of the Bay of Biscay, 270 miles, the breadth varying from 15 to 70 miles. The chain is divisible into three distinct portions — the western, the central and the eastern. Both on north and south the mountains sink down to the plains in a series of terraces with precipitous faces, the general slope on the Spanish side being somewhat steeper than that on the French side. See Taine's *Voyage aux Pyrenees.*

Pyrenoids (*pī-rē'noidz*) (in plants). In the chloroplasts of certain algæ, as in *Spirogyra,* there usually are embedded one or more colorless bodies, each one often surrounded by a jacket of starch. These bodies are reserve proteid and are known as pyrenoids.

Pyrites (*pĭ-rī'tēz*), a name employed by mineralogists to designate a number of minerals which are compounds of metals with sulphur or arsenic or both. They are hard and brittle, have a metallic appearance, and frequently are yellow. The kinds most usually mentioned are iron, copper and arsenical. Iron pyrites is sometimes mistaken for gold, on account of its yellow color, and therefore is called fool's gold. It is much used in the manufacture of sulphuric acid.

and sulphur is obtained from it by sublimation. It also is used for the manufacture of alum. Copper pyrites is the most abundant of all the ores of copper, and yields a large proportion of the copper used in the world. Arsenical pyrites or mispickel is of a silver-white color, and is the most common natural compound of arsenic. It sometimes is valuable on account of containing cobalt. In addition to those three kinds of pyrites are pyrrhotite or magnetic pyrites, which sometimes contains nickel, and marcasite or white-iron pyrites. Both of these consist chiefly of iron and sulphur.

Pyrometer (*pī-rŏm′ē-tẽr*), in engineering an instrument for measuring temperatures so high or so low that mercurial thermometers cannot be used. All the older forms of this apparatus, depending upon the expansion of solids with rise of temperature, have entirely gone out of use. Modern pyrometers are practically all dependent either upon one or the other of two electrical principles. The first of these types is based upon the discovery of Seebeck that, when an electric circuit is made up of two different metals, a current will flow in that circuit which is proportional to the difference in temperature between the two junctions. By placing a galvanometer in the circuit this current may be measured. After the circuit has once been calibrated, that is, after the caliber of a thermometer's use has been ascertained in order to graduate it to a scale of degrees, we may infer the temperature of one junction by knowing the current and the temperature of the other junction. This form of pyrometer has been perfected principally by Le Chatelier, a Frenchman. The second type of pyrometer depends upon the fact that the electrical resistance of a platinum wire varies with its temperature. Having selected a definite piece of pure platinum wire and measured its resistance at various standard and known temperatures, we have only to place this platinum wire in the region whose temperature is desired and measure its resistance. The temperature of the region is then given by interpolation. This form of pyrometer has been perfected especially through the efforts of H. L. Callendar, the English physicist. It frequently is called a platinum thermometer.

Pyr′otech′ny. See FIRE′WORKS.

Pyrrhus (*pĭr′rŭs*), king of Epirus, was born about 318 B. C. He became sole king of Epirus in 295 B. C., and in the following year increased his territories by the addition of the western parts of Macedonia. In 280 B. C., he engaged in a war against the Romans, the first battle taking place on the banks of the Siris in Lucania. After an obstinate and bloody contest, Pyrrhus won the day by bringing forward his elephants, and thereby exciting the terror of the Romans. Pyrrhus' loss of soldiers was so great that after the fight he is said to have exclaimed: "Another such victory, and I must return to Epirus alone." Hence the phrase: A Pyrrhic victory. After continuing the war another year without any substantial results, a truce was made between the belligerents, and Pyrrhus withdrew to Tarentum. In a second war with Rome, a few years afterwards, he was utterly defeated by Curius Dentatus near Beneventum, escaping to Epirus with only a few followers; but in less than a year after this he was induced to enter on a war with the Spartans. He marched a large force into the Peloponnesus and tried to take their city, but was repulsed in all his efforts. He then proceeded against Argos, where he was killed in 272 B. C. by a tile hurled at him by a woman from the roof of a house.

Pythagoras (*pĭ-thăg′ŏ-rȧs*), a Greek philosopher and founder of a school of philosophy, was born on Samos about 582 B. C.; but his history has been so obscured by a mass of legend that it is difficult to arrive at anything certain in reference to his life. He is said to have been a disciple of Thales and other distinguished philosophers and to have undertaken extensive travels for the purpose of acquiring knowledge. In the course of these travels, which continued nearly 30 years, we are told that he visited Egypt and the more important countries of Asia. We have reason to believe that he visited Egypt, at least, and that from the priests of that country learned the doctrine of the transmigration of souls, which is one of the famous tenets of his school. He is even said to have asserted that he had a distinct recollection of having himself passed through other stages of existence. On seeing a dog beaten and hearing him howl, he bade the striker to desist, saying: "It is the soul of a friend of mine, whom I recognized by his voice." Pythagoras is said to have been the first to assume the title of *philosopher* (which means a lover of wisdom) in place of the name *sophos* (which means a wise man). We have reason for believing that he was a man of much learning, especially in mathematics. His school taught that in number alone is certainty to be found; that number is the essence of all things; that in some mysterious way numbers are things themselves. The moral teaching of the Pythagoreans was of the purest and most spiritual kind; virtue was regarded as a harmony of the soul; self-restraint, sincerity and purity of heart were especially commended; and conscientiousness and uprightness would seem to have been their chief characteristics. Of the fate of Pythagoras different accounts are given, but he is generally supposed to have died at Metapontum, Magna Græcia, 500 B. C., where his tomb was to be seen in the time of Cicero.

Pyth'ian Games, one of the four great national festivals of the Greeks, are said to have been instituted by Apollo after vanquishing Python, the snaky monster. They at first were under the management of the Delphians; but about 590 B. C. the Amphictyons were entrusted with the conduct of them, after which they were held every four years at Delphi in honor of Apollo. Some writers claim that they were not called Pythian till after this date. Originally the contests were restricted to singing and cithern-playing; but the Amphictyons added the flute, athletic contests and horse-racing. By and by contests in tragedy and other kinds of poetry, in historical recitations and in works of art were introduced and long continued a distinguishing feature of these games, which are believed to have lasted four centuries after Christ. The prize was a laurel-wreath and the symbolic palm-branch.

Python (*pī'thŏn*). See Boa.

Pyxis (*pĭks'ĭs*), a peculiar pod which opens at its apex by a circular lid, as the common twinleaf (*Jeffersonia*).

Q

Q (*kū*), the seventeenth letter, is a consonant, duplicating *k* the guttural and being a superfluous character. It is always followed by *u*, *qu* having the sound of *kw* as in *conquest* and *queen*, except in some words where *u* is silent, as in *antique* and *coquette*.

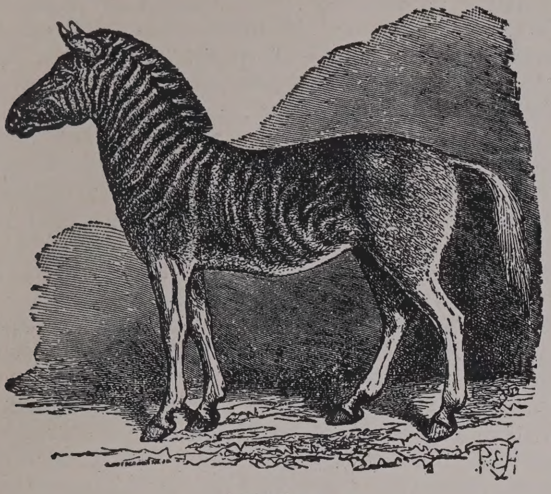
Quadrant (*kwŏd′rănt*), an astronomical instrument, invented by Hadley in 1731 for use in measuring angles at sea and in other places where a fixed divided circle is not available. The quadrant, in a crude form, had been used for several hundred years before the time of Hadley, if we admit the astrolabe graduated through 90° as a kind of quadrant. But Hadley so improved the instrument by introducing a fixed and a movable mirror and by bringing into the same line the images of the two objects whose angular distance is to be measured, that he really made a new and highly valuable apparatus. The quadrant is merely a brass frame, provided with a radial arm carrying a mirror, whose polished surface contains the axis of the quadrant. By looking through the small telescope and a half-silvered mirror (attached to the quadrant) at any particular object, one may, by rotating this radial arm, make the image of a second object appear in the same direction as the first. The angle through which the arm must be turned to secure this coincidence is half the angle subtended by the two objects; and this angle is read directly from the graduated edge of the quadrant. Sometimes only 60° of the edge is graduated, in which case the instrument is called a *sextant*. Hadley's invention immediately displaced the astrolabe and the cross-staff which had hitherto been used for taking latitudes at sea. A considerable part of the accuracy of the quadrant is due to the use of the vernier, invented by Pierre Vernier in 1631. About the same time the telescopic sight was invented by Gascoigne and the tangent screw by Helvelius. All combine to make the quadrant or sextant a thoroughly accurate instrument, now in daily use by all navigators.

Quad′rilat′eral, four fortresses of northern Italy — Mantua, Verona, Peschiera and Legnano — which form a sort of outwork to the bastion of the mountains of the Tyrol, and divide the plain north of the Po into two sections by a powerful barrier. They have figured in all the later wars fought in northern Italy, especially in the wars between Austria and the different Italian states. Russia has a similar combination in Poland. called the Polish Quadrilateral.

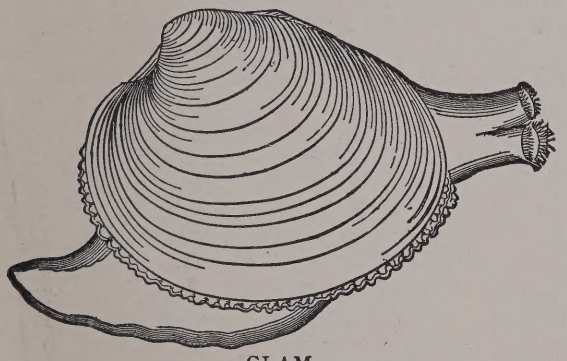
Quad′ruple Alli′ance, a league against Spain, formed in August, 1718, between Britain, France, Austria and Holland, to counteract the ambitious schemes of Alberoni. It was made upon the basis of the Triple Alliance, which had been formed in January, 1717, between England, Holland and France, and by which the clauses in the treaty of Utrecht having reference to the accession of the house of Hanover in England, the renunciation by the Spanish king of his claims to the French throne and the accession of the house of Orleans to the French throne, should the young king, Louis XV, die without issue, were guaranteed. The Spanish fleet was destroyed by Byng off Cape Passaro; the French crossed the Pyrenees and defeated the Spaniards several times; and at length Philip was compelled to dismiss Alberoni and accept the terms of the Quadruple Alliance.

Quæstor (*kwĕs′tŏr*) anciently was the title of a class of Roman magistrates, reaching as far back, according to all accounts, as the period of the kings. The oldest quæstors were the *quæstores parricidii* (investigators of murder, finally public accusers), who numbered two. Their office was to conduct the trial of persons accused of murder and to execute the sentence that might be pronounced. They ceased to exist as early as 366 B. C., when their duties were transferred to the *triumviri capitales*. But a far more important though later office was the *quæstores classici*, to whom was intrusted the charge of the public treasury. They seem to have gained the name of *classici* from their having been elected originally by the centuries. At first there were only two, but in 421 B. C. two more were added. Shortly after the breaking out of the First Punic War the number was increased to eight; and, as province after province was added to the Roman republic, they amounted in the time of Sulla to twenty and in the time of Cæsar to forty. At first only patricians could be quæstors; but after 421 B. C. the office was open to plebeians also.

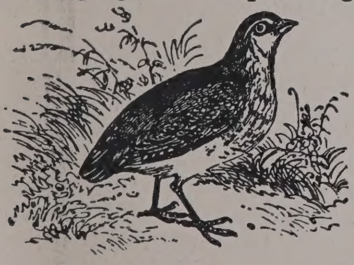
Quagga (*kwăg′gȧ*), a striped wild ass, related to the zebra and, like the latter, peculiar to Africa. It formerly abounded in herds on the plains south of Vaal River, but now is rare, if not extinct. During its abundance thousands were killed annually by Boer hunters for their skins. It is easily distinguished from the three other members of the family, although Burchell's zebra is often erroneously called quagga. The head, neck, mane and shoulders are striped, but the stripes fade out behind the shoulders, and the hind quarters and legs are unstriped. It is of stouter build than the zebra, but has ears and tail more like a horse. Its color is reddish brown above with dark brown spots, the under surface and the legs being nearly white.


QUAGGA

Quahaug (*qwa'hŏg*), the common round clam of the Atlantic coast found from Texas to Cape Cod. It is frequently seen in eastern markets and much esteemed as food.


CLAM

Quail, a small game-bird of the Old World, belonging to the partridge family. There are six species. The common European quail is about seven inches long, with a very short tail. They are of a brown color, streaked with buff. They are ground-birds. They winter in Africa, and are trapped in large numbers for the market. The birds called quail in the United States belong to a different family. The bob-white is a good type. They nest on the ground, laying from ten to eighteen white eggs, but sometimes they perch on trees. They remain through the year and should be protected and fed, for they are helpful to the farmers in destroying many injurious insects. They are especially fond of the Colorado potato-beetle.


COMMON QUAIL

Qua'kers or **Society of Friends,** a sect founded by George Fox in 1648-66. In spite of severe and cruel persecutions the Quakers established themselves in England and in America. Although not a large denomination, they have exerted a strong and good influence on the public at large by their purity of life and the stand they have taken in great questions, as war and slavery. Friends began to protest against slavery as early as 1688, and in 1787 no known Friend owned a slave. As early as 1727 they commenced to censure the traffic in slaves, and opposed it more and more warmly, until the whole British nation felt the blow and set their slaves free. Their leading doctrine is that of "internal light." They believe that the Holy Spirit or the indwelling Christ alone maketh wise unto salvation and illumines the mind with true and spiritual knowledge of the things of God. Hence they do not consider human learning essential to a minister of the gospel, and have no theological schools or classes for students. Their ministers do not receive a salary, but bestow their labor freely, and in return are freely entertained when their work takes them away from home. The Friends have from the start, by example and precept, urged "plainness of speech, behavior and apparel;" and hence a Friend could always be distinguished by certain outward peculiarities, as "thee, thou, first month, second day," instead of the usual terms used, and by their quaint garb. In 1827 Elias Hicks denied the divine authority of the Scriptures, the divinity of Christ and His atonement, and carried with him about half of the Society in America. These are now known as the Hicksite Friends, while the remainder are called Orthodox Friends. The more eminent leaders of this sect have been George Fox, Robert Barclay, Thomas Ellwood, John Woolman, William Penn and John Bright. They number in the United States about 120,000; while about 20,000 of them are in England. See Fox's *Journal* and Sewell's *History of the Quakers*.

Quarantine (*kwăr'an-tēn'*), ("a period of forty days"), is a forced abstinence from communication with the shore which ships are compelled to undergo when they are last from some port or country where certain diseases held to be infectious, as yellow fever, plague or cholera, are or have been raging. Where a quarantine is established, it is a punishable offense for any person in the suspected ship to come on shore or for anyone to disembark any merchandise or goods, except at lazarettos, which are establishments provided for the reception of goods or passengers or crew, and where such purifying processes as the sanitary science of the time prescribes are applied. Until a ship is discharged from quarantine, she displays a yellow flag at her masthead if she has a clean bill of health, a yellow flag with a black spot if not clean; at night a white light is shown at the same place. The permit to hold intercourse after performing quarantine is called *pratique*. Quarantine is not of necessity limited to a sea-frontier; it is enforced at the frontiers between adjacent states, and by cities and towns on houses in which are cases of infectious diseases.

Quar'rying is excavating stone, which may be done either by hand or by dynamite, blasting powder or other explosives. The art demands intimate knowledge of the structure of the rock to be excavated. This rock is commonly of one of two kinds, either stratified or igneous. The most important stratified rocks for quarrying are limestone and sandstone. The quarryman takes advantage of the bedding and natural cleavage of these rocks, so as to direct his efforts along the line of least resistance. Even some of the hardest of the igneous rocks, granite for example, have natural lines of cleavage, which may be utilized. The stratified rocks are split by means of a plug fixed in a hole in the rock between two wedges, known as "feathers." When the plug is hammered, the wedges operate on the stone with a great splitting force. This method, however, is only applicable to blocks of a limited size. Explosives, as dynamite and gunpowder, will loosen blocks of the largest description. Dynamite shatters the rock to such a degree that it is more serviceable in quarrying road-stone than building-stone. Sometimes a large block is cut off by a channeling machine, which cuts by means of a sharpened bar impelled by steam-power. When quarried, the stone is cut and dressed for use in building, statuary etc.

Quar'termas'ter, an officer whose duty is to provide quarter, provisions, storage, clothing, fuel, stationery and transportation for the army and to superintend the supplies. In the navy the quartermaster is a petty officer who attends to the helm, binnacle, signals and the like under the direction of the master.

Quartet', a piece of music arranged for four solo voices or instruments, in which all the parts are *obligato* — that is, no one can be omitted without injuring the proper effect of the composition. A mere interchange of melody, by which the parts become in turn principal and subordinate, without the interweaving of them, does not constitute a quartet. Quartets for stringed instruments are generally arranged for two violins, a viola and a violoncello, and are sonata in form — that is, have a progression of thought and movement. They originated with Haydn, and were further developed by Mozart and, notably, by Beethoven, who perfected the art of part-writing in music. Subsequent writers are Schubert, Spohr, Mendelssohn, Schumann and Brahms. Vocal quartets were a frequent feature in oratorios and operas up to the time of Wagner.

Quartz (*kwärts*), the name of the commonest mineral substance of nature. Chemically, quartz is silicon oxide (SiO_2). Quartz occurs in nature in the crystalline and the noncrystalline forms. When crystalline, it occurs in six-sided prisms terminated by pyramids. Well-developed crystals are most commonly found in veins or open spaces in rocks. By far the larger part of quartz, even that which is really crystalline, does not occur in the form of prisms but in the form of sand grains, pebbles etc., which themselves were derived from crystals. Quartz is one of the constituent minerals of most light-colored igneous and metamorphic rocks; is the chief constituent of most sandstone; and is an important constituent of most other sorts of sedimentary rock, except limestone. It is the hardest of the common minerals. Pure quartz is transparent, but it often contains impurities which give it distinctive and sometimes beautiful colors. Several varieties of quartz constitute gems, some of them of great value. Here belong *amethyst*, a transparent, purple variety of quartz; *agate*. the banded variety of quartz from which cameos are cut; *chalcedony*, a translucent variety; *smoky quartz; cat's eye quartz; jasper*, a red, opaque variety; various so-called *topazes* (not the true topaz); *rose quartz*, a pinkish or rose-tinted variety; and *rock crystal*, or crystals of pure quartz. *Flint* and *chert* are impure varieties of quartz. *Clear-Fused Quartz*, refined in an electric furnace, is twice as transparent to light as the finest optical glass, is transparent to the ultra-violet ray so necessary for the treatment of diseases, and is only $^1/_7$ as expansive under heat as platinum, which had been used before when heat expansion was undesirable. This recent product is now used for moving picture lenses, thermometers, and for x-ray machines.

Quebec', Can. This, the oldest province of the Dominion, entered the federation in 1867. It has Hudson St. and Bay on the north; the Gulf of St. Lawrence on the east; New Brunswick, the United States and Ontario on the south; Ontario on the west.* Quebec has an area of 706,000 square miles; double that of France and Prussia combined, and very nearly six times as large as that of the British Isles.

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*Newfoundland governs the coast of Labrador. which partly cuts off Quebec from the Atlantic.

Population 2,002,712 in 1911, nearly all Canadian in origin. The number of French is nearly five times as great as that of the British. The Roman church led numerically (1,429,260), then the Church of England (81,563), then the Presbyterian (58,013) and lastly the Methodist (42,014). Of the 150,600 occupiers of farm lands 135,625 are owners.

Climate. The climate is much like that of the other parts of eastern Canada, excepting, perhaps, that the winter is slightly colder; but the air is generally dry and bracing, the cold is not felt to be unpleasant, and the climate is exceedingly healthy.

Drainage. The St. Lawrence divides the province, and, below Quebec, begins to branch out to a noble estuary, when it reaches the Gulf of St. Lawrence. The latter forms the southern exit to the Atlantic (between Newfoundland and Cape Breton), while beyond the large island of Anticosti, at the mouth of the St. Lawrence, the Straits of Belle Isle form the northeastern exit. The St. Lawrence is navigable for ocean-steamships as far up as Montreal, and this brings Montreal 300 miles nearer to Liverpool than is New York. Ottawa River (*q. v.*), 780 miles in length, drains 80,000 square miles. The St. Maurice is navigable for 40 miles, and the Richelieu is provided with a canal to permit boats to pass from the St. Lawrence at Sorel to Lake Champlain and so to the Hudson. The Saguenay is world-famed as a picturesque river. Large vessels travel it for 60 miles, and its banks are precipitous and imposing. The Chicoutimi trip up the Saguenay is a favorite one for tourists.

Quebec has a number of beautiful lakes, notably St. John, Brome Lake and Lake Memphremagog, part of the last being in Vermont. Lakes St. Louis and St. Peter are expansions of the St. Lawrence.

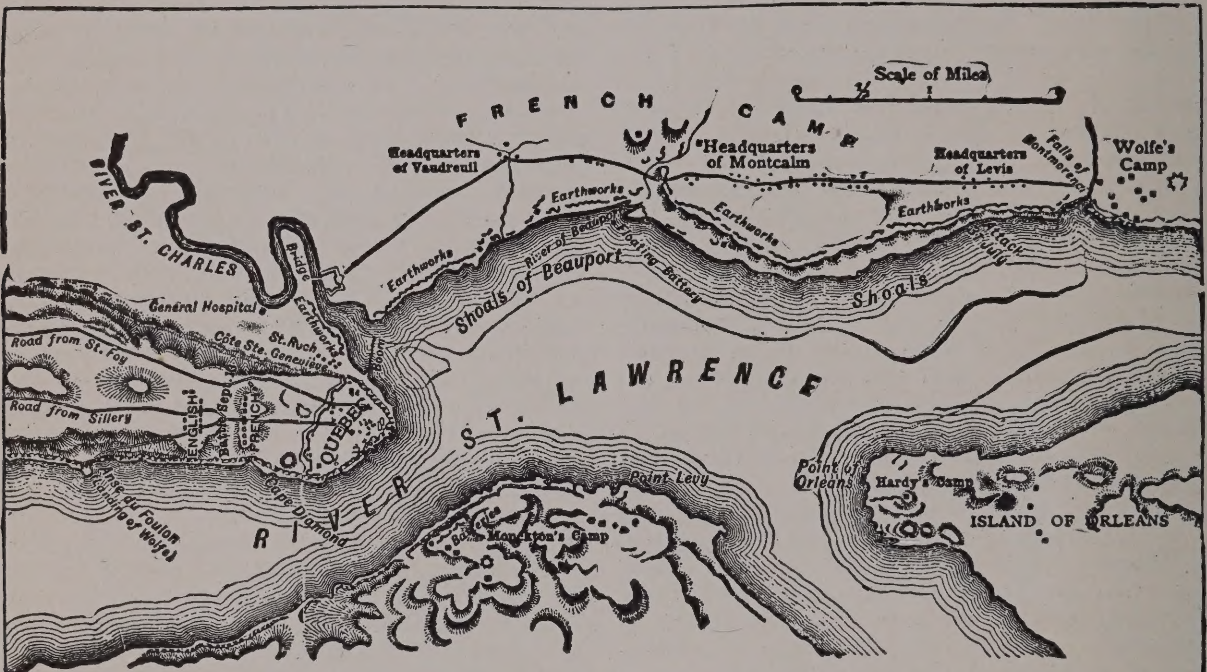
Resources. The province has many thousands of miles of forestland, so that the lumber industry is very important. The production of woodpulp is one of the main industries. Much of it is exported to the United States. Quebec has shown wise foresight, in making extensive forest reserves. The soil is rich and loamy. Cereals, hay and root-crops grow everywhere in abundance. Indian corn, hemp, flax and tobacco are also raised in many parts of the province. Fruit is grown in quantities, especially apples and plums, which are exported largely. Small fruits, grapes and tomatoes are abundant. Cattlebreeding is carried on largely, and many thousands of animals are exported to Great Britain yearly, the region east and north of the St. Lawrence being especially excellent for pasturage. The fisheries in the St. Lawrence River and Gulf are very productive, and all the smaller rivers teem with fish. The province is rich in minerals. Iron is very generally distributed; lime-phosphates and minerals —lead, silver, platinum, zinc, copper and alluvial gold—are found in various places, and Quebec supplies two thirds of the world's production of asbestos. Agriculture and dairy-farming form the chief occupations, but manufactures, fisheries, commerce, lumbering, mining and shipbuilding employ a considerable part of the inhabitants.

Transportation. The valley of the St. Lawrence and that of the Ottawa are fertile and well-settled. Railways run down both banks of the St. Lawrence from Montreal to Quebec and from Montreal west to Ontario and south to the United States. Ottawa is connected by three lines with Montreal. River navigation on the St. Lawrence and Ottawa is excellent. North of the St. Lawrence the settlement is not broad, for the Laurentian Mountains erect a barrier. The southern section of the entire province from the river to the United States boundary and east to Rimouski is thickly settled and dotted with thriving towns. Across the west of this southern section run railways from Montreal through New York, Vermont and New Hampshire to New York City, Boston and Portland.

Education. The public schools are under the control of two school-boards — one Catholic and the other Protestant — each of which enjoys absolute control of its own schools. The school-rates are levied separately, and the utmost freedom is enjoyed in religious exercises and the choice of books. The Roman Catholic population of the province is 80 per cent. of the whole. The French as compared with the English population of Montreal is as three to two. A magnificent agricultural college and experimental farm has been established at St. Anne's near Montreal, due to the generosity of Sir Wm. Macdonald of Montreal. It is doing great good in advancing the agricultural interests of the province. Two large and important universities, McGill and Laval, are doing excellent educational work in Montreal, and Laval, fortunate in having had Monsignor Mathieu as rector, is carrying on similar work in the City of Quebec. The attendance at McGill averages 1,300 students. Its faculties of medicine and applied science are especially strong. See LAVAL, MCGILL, MATHIEU and PETERSON.

History. Old Canada was the St. Lawrence valley, and the first settlements naturally were near the mouth of the river. Much of the romance of early Canadian history centers in Quebec. Here the first French explorers came and forced their way up the mighty river, which would, they hoped, prove a shorter route to the Indies. At Quebec and at Montreal they built their stockades and planted their settlements, and from these points went all those daring expeditions of traders and missionaries up the Ottawa, to Georgian Bay, to the headwaters of the Mississippi and elsewhere into the unexplored land of the forest, the furbearing and the Indian.

The province is governed by a lieutenant-governor, who is appointed by the governor-general, a legislative council, consisting of 24 members appointed for life, and a legislative assembly of 82 members, elected every five years. The seat of the local government is Quebec. The province is represented in the Dominion senate at Ottawa by 24 members and in the house of commons by 65 members. The principal city is Montreal, the commercial metropolis of the Dominion. Quebec, the next city in importance, is the seat of local government and the most historic city in Canada. See *Quebec, Past and Present*, by Sir J. M. Lemoine; *Picturesque Quebec; Sketch of the Province* by Honoré Mercier; and Cassell's *Picturesque Canada*, edited by Principal Grant.


FRENCH CAMP
Scale of Miles
½
1
Headquarters of Vaudreuil
Headquarters of Montcalm
Headquarters of Levis
Falls of Montmorenci
Wolfe's Camp
Earthworks
Earthworks
Earthworks
Earthworks
Earthworks
River of Beauport
Shoals of Beauport
Floating Battery
Attack 31 July
Shoals
RIVER ST. CHARLES
Bridge
Boom
General Hospital
St. Roch
Côte Ste. Genevieve
Road from St. Foy
Road from Sillery
ENGLISH
Battle Sept. 13
FRENCH
QUEBEC
Anse du Foulon (Landing of Wolfe)
Cape Diamond
RIVER ST. LAWRENCE
Batteries
Monckton's Camp
Point Levy
Point of Orleans
Hardy's Camp
ISLAND OF ORLEANS

SIEGE OF QUEBEC
1759.

Quebec, capital of the province of that name, stands on a steep promontory of the St. Lawrence at its junction with St. Charles River, 300 miles from the Gulf of St. Lawrence and 180 below Montreal. Quebec is the most important military position in Canada. The citadel occupies an area of 40 acres and commands a magnificent view. The harbor is spacious, and the docks and tidal basin are perfect specimens of engineering skill. The city is divided into an upper and a lower town. In the latter are the banks, warehouses and stores. In the upper town are the principal residences, public buildings, churches, gardens and retail shops. Toward the west are the thriving suburbs of St. John, St. Louis and St. Roch's. The last has become a place of commercial importance, with immense warehouses and stores. To the southwest of St. John are the Plains of Abraham, the historic battlefield, where a column 40 feet in height has been erected to the memory of General Wolfe. Other monuments are dedicated to Wolfe and Montcalm, Champlain and Bishop Laval. Four martello-towers occupy elevated positions. In the upper town is Dufferin Terrace, 1,140 feet long and 200 feet above the water. A cantilever railroad bridge across the St. Lawrence here has twice collapsed in the course of construction, but will ultimately be completed. Principal buildings: Courthouse, postoffice, custom-house, city-hall, Laval University, masonic hall, basilica, archepiscopal palace, Anglican and French cathedrals, Church Hall, Young Men's Christian Association building and parliamentary and department buildings. Quebec is connected with all cities in America by lines of railroad, and on the St. Lawrence is, with Montreal, at the head of ocean-steamship navigation to Europe. Population 182,000. Consult G. Mercer Adam's *Illustrated Quebec* and Doughty's *Quebec Under Two Flags.*

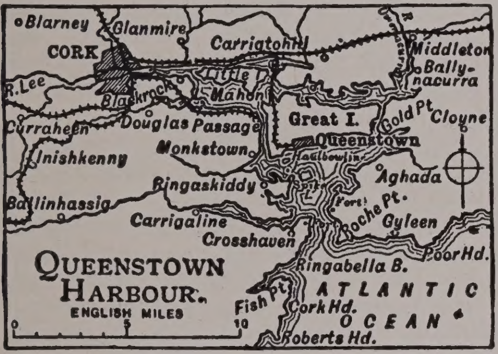
Queen Charlotte Islands, a group north of Vancouver Island, off British Columbia. Area 5,100 square miles. The two principal islands, Graham and Moresby.

have a length of 160 and a greatest breadth of nearly 70 miles. The climate is healthy, but very rainy. Anthracite, copper, iron-ore and gold-bearing quartz have been found, and forests abound. The inhabitants are about 1,000 Indians, who engage in fishing.

Queen Charlotte Sound is a strait separating Vancouver Island, B. C., Canada, on the north, from the mainland.

Queens'land. See AUSTRALIA.

Queens'town, a seaport of Ireland, on the south side of Great Island, in the harbor of Cork, 177 miles southeast of Dublin. Its original name was Cove of Cork; the present name is in memory of the visit of Queen Victoria in 1849. The town is built in parallel streets on the slopes of a hill shaped like an amphitheater. It is noted for its mild and healthful climate. The splendid Roman Catholic cathedral for the Cloyne diocese is the principal building. Queenstown is an important port of call, the mails from the United States being landed here and sent overland to Dublin. Population 9,590, See *Harper's Magazine*, September, 1884.



Quere'taro (*kâ-râ'tà-rô*), one of the inland states of Mexico with a city of the same name, is on a high plateau, 120 miles northwest of Mexico City and 350 from Vera Cruz. The area of the state is 3,556 square miles, with a population of 243,515. The population of the city, its capital, is 35,011. The town was taken by the Spanish from the Chichimec Indians in 1531. Here in 1867, Maximilian, Archduke of Austria and Emperor of Mexico, made his last stand, and here he was shot. The town is an important manufacturing center, and near it are some rich mines of silver, lead, iron and copper. The chief products, however, are maize, fruit and cotton, There are some fine public buildings and a church (that of Santa Clara), noted for its beautiful wood-carvings.

Quern (*kwĕrn*), a mill used in early times for grinding corn, the stone of which was turned by hand. It is a contrivance of great antiquity, and so well-adapted to the wants of a primitive people that we find it at the present day in remote districts of Ireland and in some parts of the Hebrides and Shetlands. The remains of querns have been dug up in Britain, Ireland and continental Europe wherever the traces of ancient population are found. The most usual form consists of two circular, flat stones, the upper one pierced in the center with a narrow funnel and revolving on a wooden or metal pin inserted in the lower. The upper stone is occasionally ornamented with various devices; in the Roman period it sometimes was funnel-shaped, with grooves radiating from the center. In using the quern the grain was dropped with one hand into the central opening, while with the other the upper stone was revolved by means of a stick inserted in a small opening near the edge.

Quick'sand (quick, *i. e.* living or moving sand), a tract of sand which, without differing much in appearance from the shore of which it forms a part, remains permanently saturated with water to such an extent that it cannot support any weight. Quicksands are most often found near the mouths of large rivers. They appear to be formed only on flat shores, the layer of earth under the sand being stiff clay, which water cannot pass through; and in narrow channels, through which the adjoining shore from its shape causes strong tidal currents to run, the sand may be kept so constantly stirred up by the moving water that a quicksand results. Quicksands are not commonly of great extent, and their danger has probably been exaggerated in the popular mind by sensational descriptions in works of fiction, as in the *Bride of Lammermoor* and in *Moonstone*.

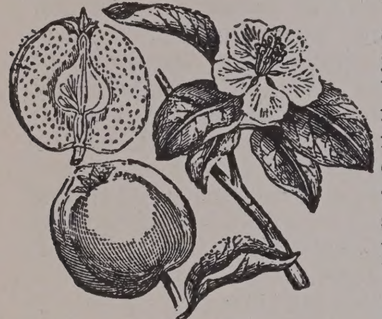
Quick'sil'ver. See MERCURY.

Quil'ler-Couch', A. T., English novelist, essayist and literary critic, was born in Cornwall in 1863, and early in his career was a classical lecturer at Trinity College, Oxford (1886-7). For the next ten years he was on the staff of *The Speaker* (London) or connected with it as a contributor. Some of his essays and reviews in *The Speaker* and elsewhere will be found in a collection under the title of *Adventures in Criticism* (1896). About ten years earlier he devoted himself to the writing of fiction, many of the characters in his novels, together with much of the scenery and traditions of his native county, treating of Cornwall. Among his novels are *Dead Man's Rock; Troy Town; The Mayor of Troy; The Splendid Spur; The Delectable Duchy; The Ship of Stars; Old Fires and Profitable Ghosts; The Adventures of Harry Revel; Hetty Wesley;* and *Sir John Constantine.* In 1904 he published *Fort Amity*, a story which treats of the stormy days of war with France in Canada. Besides completing Stevenson's unfinished romance of *St. Ives* and writing a monograph on George Eliot, Mr. Quiller-Couch has issued delightful verses and parodies under the title of

Green Bays, with *Poems and Ballads* and many charming short stories.

Quin, James, a celebrated actor of Irish descent, was born at London in 1693, and made his first appearance on the stage at Dublin in 1714. Shortly after, he was engaged at Drury Lane, London, but for quite inferior parts. In 1716, however, the sudden illness of a leading actor led to Quin being called to take the character of Bajazet in the once-famous play of *Tamerlane*. His success was marked. Next year he went to Rich's Theater at Lincoln's Inn Fields, where he remained as a principal actor for 17 years. The only really fine parts which he seems to have played were Captain McHeath in the *Beggar's Opera* and Falstaff in *The Merry Wives of Windsor.* In 1734 he returned to Drury Lane Theater "on such terms," says Cibber, "as no hired actor had before received;" and from this date until the appearance of Garrick in 1741 he was by universal consent the first actor in England. He died at Bath, Jan. 21, 1766.

Quince, the fruit of a species of *Pirus* (*P. cydonia*), a member of the rose family. The species is sometimes regarded as entitled to separate, generic rank, and is then called *Cydonia vulgaris.* It is said to be a native of northern Persia, but is naturalized through the northern hemisphere. There are only three principal varieties in cultivation: Those in which the fruit is apple-shaped; those in which it is pear-shaped; and the so-called Portugal quince, which has very large fruit. The flavor of the quince makes it a favorite fruit for jellies and marmalade.



QUINCE

Quin'cy, one of the most progressive cities in Illinois, the county-seat of Adams County, is on the Mississippi, and was founded in 1822. It has steadily grown into a manufacturing city of considerable importance. Among the articles manufactured are stoves, farm implements, incubators, metallic wheels, stationary engines, engine supplies, furniture, clothing, carriages, paving and building brick, lumber and lime. In addition to several railroad lines, the city has river transportation. The public institutions include a library of 22,000 volumes, a fine courthouse, soldiers' and sailors' home, hospitals, churches, Federal building, Chamber of Commerce building, Masonic Temple, State Armory and many parks. The city has thirteen public school buildings with an enrollment of 5,000, twelve parochial schools with an enrollment of 2,500, two large business-colleges and several private schools. The city is noted for its beautiful shade-trees, paved streets and healthful situation on a bluff above the river. The population is 40,000.

Quincy, Mass., is a historic city and seaport of Norfolk County, on Quincy Bay. It is separated from Boston by the Neponset River on the north and from Weymouth by Fore River on the south. It is on the New York, New Haven and Hartford Railroad and the Old Colony Street Railway. It is noted for its granite, and for this reason is sometimes called the Granite City. Besides the granite industry its inhabitants engage in ship-building and the manufacture of rivets and studs, gears, telephone apparatus and foundrying. Besides an excellent system of public schools there are Woodward Institute (a secondary school for girls), Quincy Mansion School (a girls' boarding-school), Thomas Crane Library (public), a city-hospital and other civic and social institutions both public and private. Quincy is often called the City of Presidents, as it is the place of birth, residence and burial of John Adams and John Quincy Adams. It also is the birthplace of John Hancock. The population of Quincy is 60,000.

Quincy, Josiah, an American lawyer, was born at Boston, Feb. 23, 1744, and died at sea, off Gloucester, Mass., April 26, 1775. After graduating at Harvard in 1763, he studied law. He took a strong stand against the oppressions of the parliament of the mother-country and its violations of the rights of the colonists, and his name is associated with those of James Otis and Joseph Warren as men who had most influence in bringing about the Revolution. Although Quincy had a slender frame and ill-health, his gift of oratory, heightened by a voice of rare beauty and compass and an impassioned and graceful delivery, had great weight in public assemblies. When Captain Prescott and the soldiers who fired on the people in the Boston massacre of March 5, 1770, were arrested, Josiah Quincy and John Adams were applied to in their behalf to act as their counsel, and, although they earned great reproach by doing so, the acquittal of the prisoners on trial the next autumn justified their course. In May, 1774, he published his chief political work: *Observations on the Boston Port Bill, with Thoughts on Civil Government and Standing Armies.* In September, 1774, he went to England on a private mission for the popular cause, as also for his health. This visit excited much notice in London. He had interviews with Lords North and Dartmouth at their own request, had intercourse with Dr. Franklin and other friends constantly, and received the most bitter personal abuse from Lord Hillsborough. He returned early in the spring, against the advice of his physician, and died just before arriving. Almost his last words were that he could die content if he had an hour's talk with Samuel Adams or Joseph Warren. See *Life* by his son, Josiah Quincy (1820).

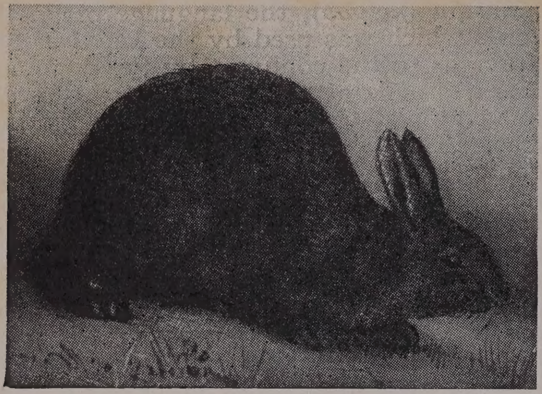
Quinine (*kwī'-nīn* or *kwĭ-nēn'*), is an alkaloid in the bark of numerous species of cinchona and in one species of remigia, its yield varying from 1½ to 8 per cent. Quinine is obtained from the powdered bark by treating it with lime; extracting the mixture with alcohol; neutralizing with an acid so as to obtain a salt of quinine; and finally purifying the product. Preparations of quinine, especially the sulphate, are largely used in medicine.

Quinoa (*kwĭ-nō'ȧ*), a valuable food-plant, a native of Chile and the high tableland of Mexico. In these countries it is much cultivated for its seed, which forms a principal food of the inhabitants. The meal made from some varieties of the seed has a somewhat peculiar flavor, but is very nutritious, and is made into porridge and cakes.

Quintil'ian, M. Fabius Quintilianus, was born about 35 A. D., at Calagurris in Spain, and attended the lectures of Domitius Afer in Rome. After 59 A. D., however, he revisited Spain, whence he returned to Rome in the train of Galba and began to practise as a pleader in courts, gaining considerable reputation. He was more distinguished as a teacher of oratory, however, and his instructions were eagerly sought, his pupils including the younger Pliny and the two grand-nephews of Domitian, who conferred the title and insignia of consul. After 20 years of labor as advocate and teacher, he retired to private life and died about 95 A. D. His reputation rests securely on his great but mutilated *Institutes of Oratory*, a complete system of rhetoric. It was written after he had ceased to be a teacher, and was the fruit of two years' labor, as he says in his preface. The best edition of Quintilian's work is that of Burmann. There also are special editions of the tenth book, a masterly criticism of classic literature that ranks Quintilian with the great critics.

Quipu (*kē'pōō*), the language of knotted cords which was used by the Incas of Peru previous to the conquest by the Spaniards. A series of knotted strings was fastened at one end to a stout cord; the other end hung free. This was used for the purpose of conveying commands to officers in the provinces and even for recording historic events.

Quito (*kē'tō*), the capital of Ecuador, lies almost on the equator, on the east of a great plateau, at the foot of a volcano and at an elevation of 9,351 feet. The appearance of Quito is picturesque, with beautiful mountains on every side. This, with its clear, healthy and temperate climate maintaining perpetual spring, makes it one of the most charming cities of South America; yet the abrupt changes from the hot sun of midday to the chills of evening make pneumonia and diseases of the chest very common. Public buildings include a university, seminary, institute of science, observatory, museum, library of 20,000 volumes, cathedral, archbishop's palace, city-hall, capitol, a penitentiary, hospital, lunatic asylum, retreat for lepers, a score of churches and three times as many monasteries. Most of these are in a dilapidated condition, for which it is hard to find any reason but laziness; for they retain their lands and revenues, and the offerings of the faithful, who nearly all are Indians are as constant as ever. Indeed, Quito is the paradise of priests and church bells jangle all day long; for Ecuador is the pope's most faithful province and the one state which refuses to recognize the unity of Italy and the condition which resulted from the occupation of Rome. There are only two or three good stores and no hotels; the daily market in the square before the monastery of San Francisco is the general purchasing place; and the religious houses serve for hotels. Quito was founded in 1534, and has suffered frequently from earthquakes. Population about 80,000, mainly Indians and Mestizos (half-Spanish or Creole and half-Indian). See EDUCADOR.

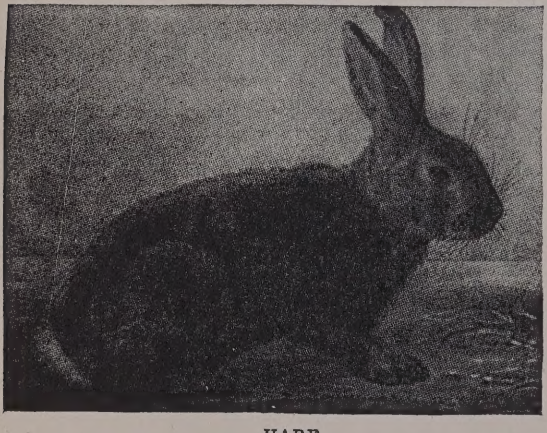


WILD RABBIT

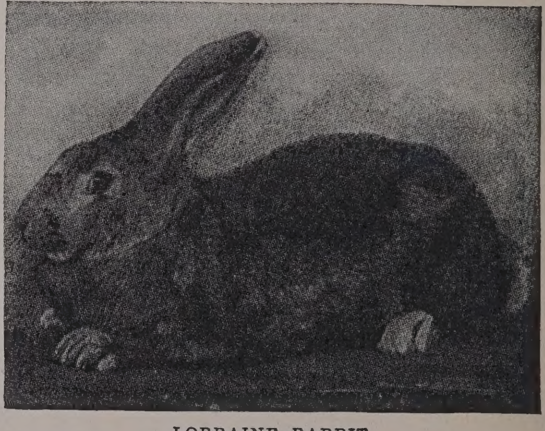
DUTCH RABBIT

BELGIAN RABBIT

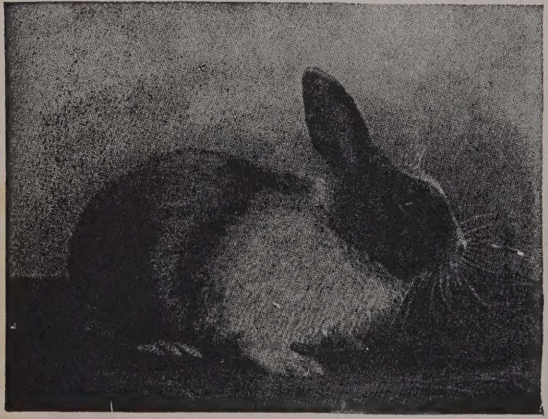
ENGLISH RABBIT



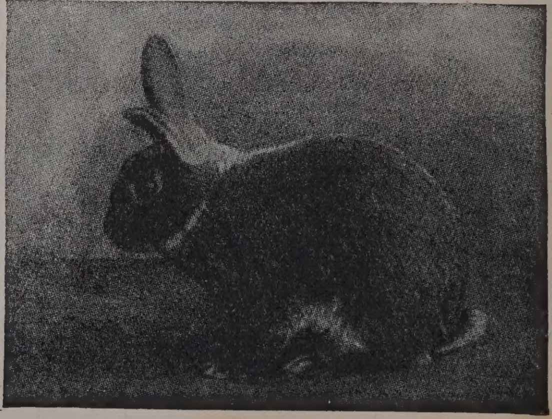
HARE



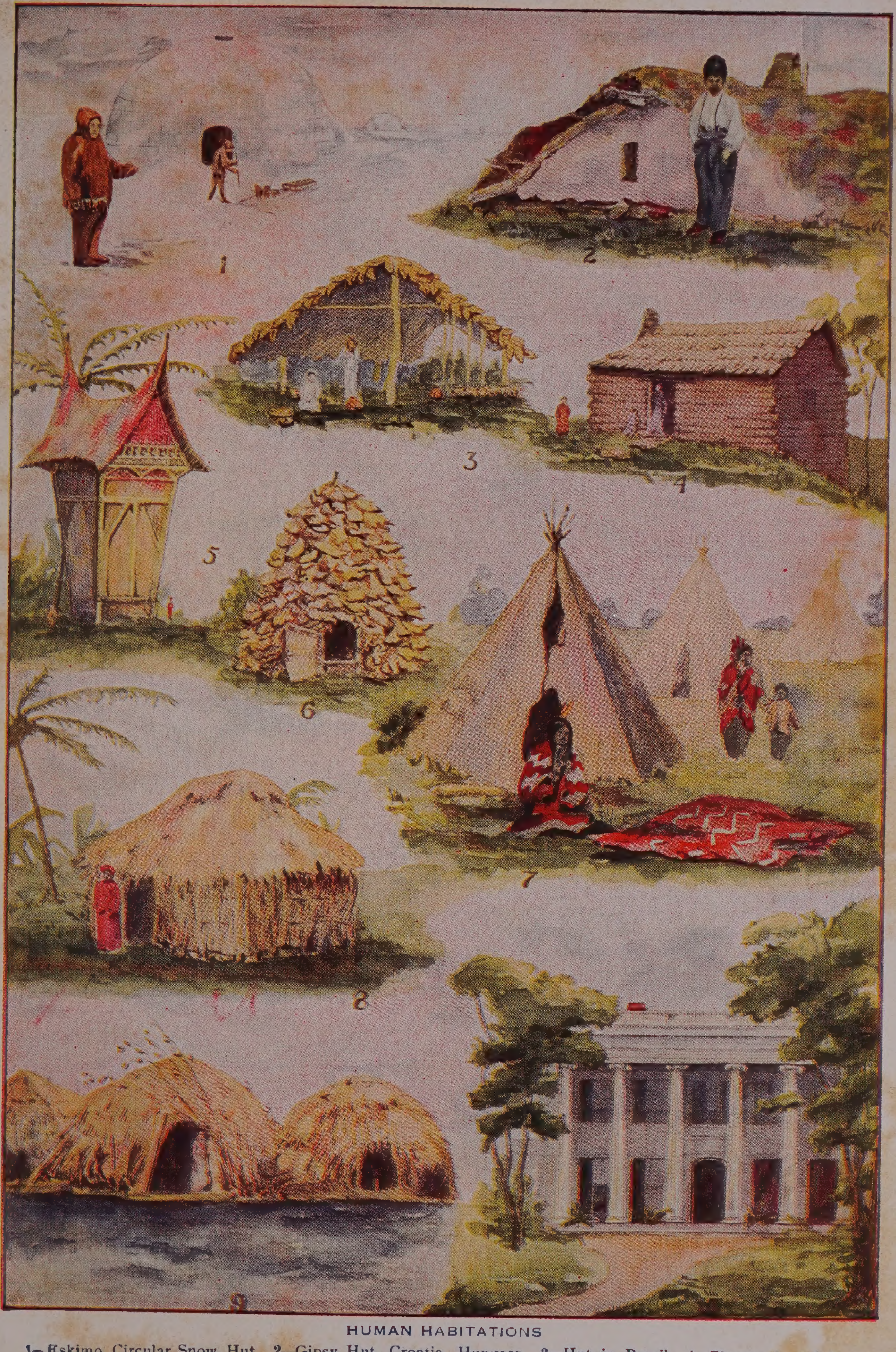
LORRAINE RABBIT



JAPANESE RABBIT



BLUE AND STRAW COLOR



HUMAN HABITATIONS

1—Eskimo Circular Snow Hut. 2—Gipsy Hut, Croatia, Hungary 3—Hut in Brazil. 4—Pioneer Log Cabin.
5—Home in Sumatra. 6—Congo Hut, made of leaves. 7—Indian Tepees. 8—Porto Rican Hut.
9—Floating Village, Congo, Africa. 10—Southern Mansion. United States.

R

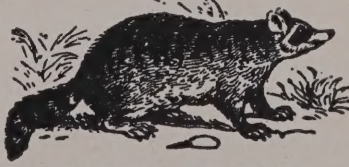
R (*är*), the eighteenth letter, is a voiced consonant. Sometimes it is made between the hard palate (or the teeth) and the tip of the tongue, as in *array*, *rise*, *trace*. This is dental *r*, employed before a vowel and usually rolled or trilled. Sometimes *r* is made with the upper surface of the tongue on the back of the hard palate. This is palatal *r*, as in *arm*, *raw*, *war*. Sometimes *r* also is a semi-vowel, sometimes a liquid. *R* is closely related to such mixed vowels as *u* in *up* and *urn* and *e* in fern. The Scotch and Irish roll *r* strongly, but the Chinese cannot even say it, substituting *l*.

Rabat (*rä-bät'*), also called New Sallee, a seaport city of Morocco, Africa, is situated on the south side of the Bu-Regreg, where it empties into the Atlantic. The most conspicuous object in the town is the tower of Beni-Hassan (180 feet high); and near it is the ruined mosque of Almanzor, originally intended to be the largest in the world. Formerly Rabat was the center of European trade with Morocco; but, owing to the silting of the mouth of the river, its commerce has greatly declined. Its chief exports are goat and sheep skins, hides, wool, almonds, wax and gum. Its annual exports average £96,000; its imports £332,000. Population 26,000.

Rab'bi, an honorary title applied to teachers and masters of the Jewish law, being in common use in the time of Christ, who was frequently addressed as such by his disciples. Other forms of the same title are *Rab*, master; *Rabban*, our master; and *Rabboni*, my master.

Rab'bit, a rodent with long ears, belonging to the same genus as the hares. The smaller burrowing varieties are called rabbits; the larger ones and those that do not construct a burrow are called hares. Hares are born with fur and open eyes; rabbits, naked and blind. A typical hare is large, has long ears and legs, is a swift and tireless runner; rabbits are small, have short ears and legs, and are not strong runners. Both hares and rabbits have numerous enemies, who cause their timidity and tremors. The so-called jack-rabbit really is a jack-hare. The cotton-tail is a typical rabbit. They feed on grass, herbs and tender bark. Those in captivity will eat nearly all kinds of vegetables and at times should be given dry food, as shelled corn. The tame rabbits have been modified and varied by selection and breeding. They multiply rapidly, having from four to eight litters a year. They were introduced into Australia about the middle of the 19th century and into New Zealand in 1860. They multiplied till they were a great menace to the crops and to vegetation. The government offered a bounty for their skins, and in a single year more than twenty-five millions were killed in New South Wales alone. The skin is of little value, but the hair has been used in making the body for felt hats. See HARE.

Rabelais (*rȧ'b'-lā'*), **François,** the greatest of French humorists, was born, according to the general statements of biographers, in 1493, but more probably a few years earlier, near Chinon, a small town in Touraine. At the request of his father he became a brother of the Order of St. Francis in the convent of Fontenay-le-Comte about 1519, and devoted himself with the utmost ardor to his hitherto neglected studies. To medicine in particular he seems to have been strongly attracted, and, in addition to Latin and Greek, he is said to have mastered Italian, Spanish, German, Hebrew and Arabic. Charged with heresy on account of his devotion to learning, he left the convent, and later was a monk of the order of St. Benedict, then lecturer in the University at Montpelier and finally canon of Cardinal Bellay's abbey near Paris. He died at Paris, April 9, 1553. Rabelais' great romance, in which are narrated the adventures of Gargantua and Pantagruel, continues to hold its rank as a masterpiece of humor and grotesque invention. In form a sportive and extravagant fiction, it is a pointed criticism of the corrupt society of the period, the follies and vices of which are pictured with marked ingenuity and effect; but, at the same time, on account of its free tone and plainness of speech few books are less suitable for general perusal. Rabelais also ranks among the theoretical reformers of education.


COMMON RACCOON

Raccoon (*răk-koon'*), a tree-climbing, nocturnal animal belonging to the bear family and restricted to North and South America. The common "coon" of the United States is widely distributed. It has a stout, clumsy body about two feet long without the tail, which is about a foot in length.

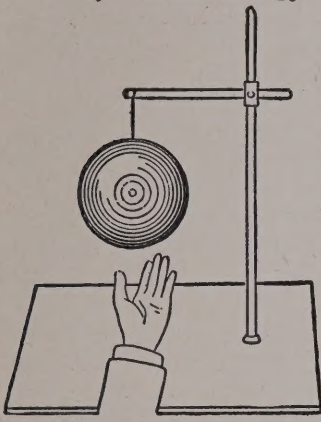
The long, coarse hair of the body is grayish-brown, and the tail is ringed with black and white. The raccoon has a broad head and a pointed muzzle, and the face is crossed by a dark band which includes the eyes. The home of the animal is usually high up in the hollow of a large tree; here it rests by day and hibernates through the severe winter-weather. It is active at night, and, during the season of young corn, is often very destructive to the green ears. Besides corn, in season, its usual food is fish, crayfish and various mollusks, though it also eats mice, insects, fruits, small birds and eggs. It has the curious habit of washing or dousing its food repeatedly in the water, and by the Germans is therefore called the wash-bear. The common raccoon of South America is called the crab-eating raccoon. A coon-hunt on a moonlight night, with torches and dogs, is a common form of sport in the southern United States.

Ra'ces of the World. The most general division of the human family is into five great races: the Caucasian, the Mongolian, the Malay, the Ethiopian and the American. The Caucasian race is the most numerous and the most widely spread over the earth of all the races. It is distinguished by a fair complexion, a high forehead, straight hair and a beard varying in color. This race is dispersed over nearly the whole of Europe and North America, northern Africa and large areas in Asia, Australia and southern Africa. It leads the other races in literature, commerce and all the arts of civilization. The Mongolian race has a yellowish complexion, small eyes, prominent cheekbones and rather coarse, black hair. It comprises the Chinese, the Japanese, the Turks and many other nations in Asia, with the Magyars of Hungary and the Esquimaux of North America. The Malay race has a dark-brown complexion, with a skull like the Caucasian; a flat face like the Ethiopian; and straight, dark hair like the Mongolian. This race is found in Madagascar, Australia, the islands of the Pacific and the Malay Peninsula of Asia. The Ethiopian or African race has a black complexion, a rather low forehead, a broad, flat nose, thick lips, thin beard and woolly hair. It inhabits the greater part of Africa, although it has ten million representatives in North America. The American race (Indians) has a red or copper-colored skin, high cheek bones, coarse, black hair and scanty beard. It is found in certain portions of North America and South America. The population of the world may be estimated in round numbers at 1,500,000,000, of which more than 1,000,000,000 belong to the Caucasian and Mongolian races. Various divisions and subdivisions of these races have been made by ethnologists durng the last twenty-five years.

Ra'chel, properly **Elisa Rachel Felix,** the great French tragic actress, was born of Jewish parents at Mumpf, in the Swiss canton of Aargau, March 24, 1820. She had her first lessons in singing at Paris about 1830, when her parents took up residence in that city, and in 1838 appeared as Camille in *Les Horaces* in the Théâtre Français. From this time she shone without a rival; and the furore excited in Paris in 1848 by her recitation of the *Marseillaise* will continue to connect her name with the Revolution of that year. In 1849 she made the tour of the French provinces, and afterwards visited London, St. Petersburg, Berlin and other great cities of Europe, everywhere meeting enthusiastic admiration and applause. In 1855, while on a professional visit to America, her health gave way, and she returned home utterly prostrated, her death taking place at Cannes, near Toulon, Jan. 3, 1858. As an artist, within the limits prescribed by her genius, Rachel has never been surpassed. No language can give an idea of the force and intensity which characterized her rendering of passion. Her *Phèdre*, by common consent her masterpiece, was the incarnation of agony, not to be forgotten by anyone who ever heard it. "She does not act — she suffers," a fine critic has observed of her. But in spite of her great genius she was never tenderly loved, being grasping and avaricious. She left a large fortune, besides the amounts lavished upon her family during her life.

Racine', Wis., is a prosperous manufacturing city at the mouth of Root River, 23 miles south of Milwaukee. Racine's position on a bluff, fifty feet above Lake Michigan, gives an excellent drainage as well as a beautiful view of the lake. Racine is noted for the manufacture of wagons, thrashing-machines, boots, shoes, boilers, engines, boats, malleable iron and automobiles. There are three banks, a public library and an excellent system of public schools. Population 70,000.

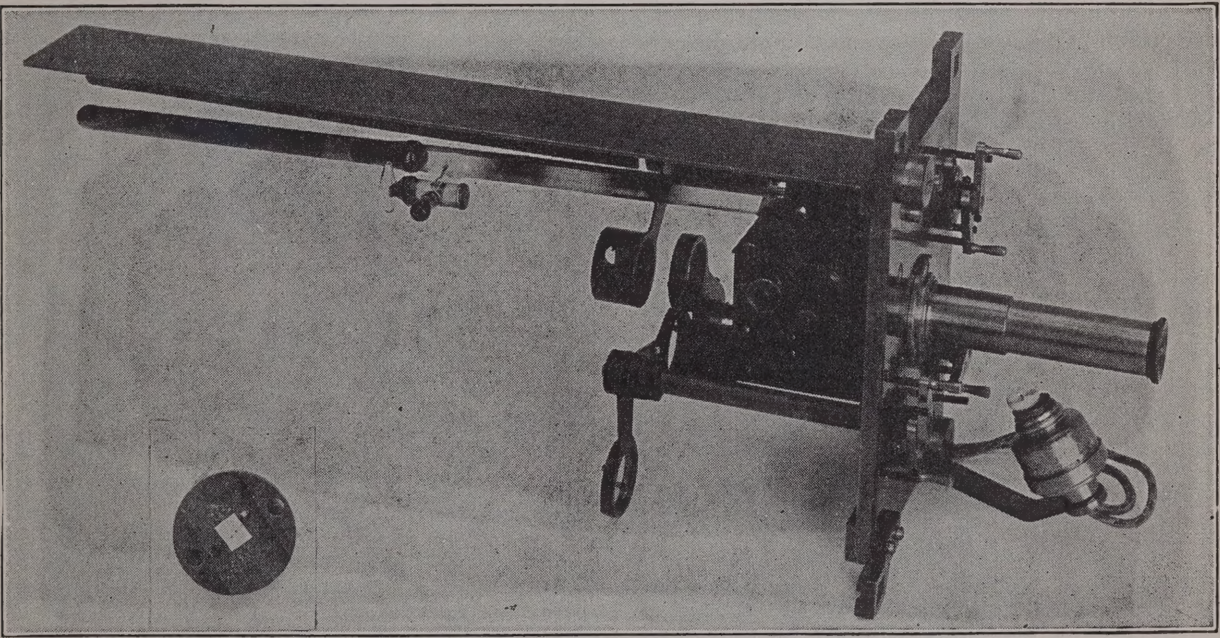
Racine (*rȧ' sēn'*), **Jean Baptiste,** the greatest dramatic poet of France, was born at La-Ferté-Milon, in the modern department of Aisne, in December, 1639. His parents dying when he was very young, he was cared for by his maternal grandfather, being sent first to Beauvais College and afterwards to Port Royal, at which he studied diligently under such masters as Claude Lancelot, Nicole and La Maitre. At 19 he left Port Royal to pursue a course of philosophy at the Collège d'Harcourt, where he appears to have first felt the attractions of a life devoted to letters and to have become intimately acquainted with various actors and actresses. Racine's earliest play was acted by Molière's company at the Palais Royal theatre in June, 1664, and in the same year he received from the king a pension of 600 francs for a congratulatory ode. The next fifteen years Racine devoted to writing plays, and produced a number of works, all of which bore the stamp of very high, if not the highest, genius. His last production, *Phèdre*, which appeared in 1677, was the one in which Rachel's genius, in the 19th century, reached its highest manifestation. His chief writings are *Esther*, *Athalie*, *Phèdre*, *Bajazet* and *Iphigénie*. He died at Paris, April 21, 1699, and was buried according to his own request at Port Royal.



Radiation of heat downward from a hot iron ball

Ra'dia'tion, one of the fundamental processes by which energy is transmitted from one point to another. The word is sometimes used also to denote the quantity of energy transmitted as well as the process. If one consider the incandescent carbon filament of an ordinary electric lamp and hold his hand either at the side or underneath it, the sensation of heat is distinctly recognized. The result of the above experiment will be found to hold true when the hand is placed some inches underneath a heated ball which is emitting no light at all. The query arises as to how the heat gets from the ball down to the hand. It certainly is not by conduction, for air is one of the very poorest of conductors. Nor can it be by convection, for convection-currents heat only the regions above the lamp or ball. Now it has been proved by elaborate series of experiments, extending over the entire 19th century and performed by Herschel, Prevost, Carnot, Melloni, Balfour Stewart, Kirchhoff, Hertz and others, that this "something" which passes from the ball to the hand behaves exactly as light-waves behave in nearly all particulars. It travels with the same speed as light, can be polarized as light, can be reflected and refracted as light, etc. The unavoidable inference, therefore, is that that which we call heat in the ball and heat after it is received by the hand is *not* heat while traveling from the ball to the hand, but is a wave-motion in the ether just as light is, the principal difference being that the heat-waves are longer than the light-waves. This is a process known as *radiation*, and the energy thus transmitted, whether in the form of long heatrays or luminous rays or so-called actinic rays or electrical vibrations, is all grouped under the head of *radiant energy*.

Radio, see Telephony, Wireless, page 1881, Volume V.



Modern Vacuum Radiometer

This device, owned by the Bureau of Standards, Department of Commerce, is so sensitive that when used in connection with a reflecting telescope having a mirror three feet in diameter, it could detect the heat from a candle 53 miles away. When used without a mirror, it could detect heat from a candle at a distance of a quarter of a mile. It is especially adapted to measuring heat from the stars, which have been measured accurately down to the seventh magnitude.

The inset to the left of the major machine is the radiometer, which consists of a single thermocouple of bismuth and platinum wires $^2/_{100}$ millimeter in diameter in a vacuum maintained by means of metallic calcium in a quartz glass tube.

Radioactivity (*rā-dĭ-ō-ăk-tĭv'ĭ-tĭ*), is that property possessed by such substances as radium, actinium, uranium and thorium, of spontaneously and continuously emitting rays which can penetrate bodies opaque to ordinary light. The bodies of these substances are of high atomic weight. It was but a short time after the discovery of the X-rays by Professor Röntgen in 1895, that it was found possible to induce radioactivity in uranium. In 1896, a French physicist, M. H. Becquerel of Paris, discovered that certain radiations could be spontaneously emitted upon a photographic plate from the salts of uranium. He further discovered that these rays discharged electrified bodies and produced phosphorescence. He showed by his experiment that a uranium compound when brought close to a charged plate of a gold electroscope, effected a rapid collapse of the gold leaves. Uranium rays were capable of discharging a body whether it was positively or negatively electrified. These rays were named, in honor of the discoverer, Becquerel rays. Mme. Curie discovered that the radioactivity of various compounds of the substance uranium was proportioned to the amount of uranium present.

Many physicists began to conduct investigations of radioactive bodies, the study of which has been of extreme importance to science. Physicists found it possible through such investigations to study the structure of the atom and the processes which occur within the atom. One of the first important results of these investigations of radioactive elements was the proof that elements do exist with similar or identical physical and chemical properties, but with different radioactive properties and of different atomic weights. The discovery by M. Becquerel of the radioactive properties of uranium provided science with a quantitative method for accurate comparison of the intensity of radiations from radioactive substances.

Three years after M. Becquerel's discovery, M. and Mme. Curie succeeded in isolating two intensely radioactive substances, radium and polonium. The following year, in 1899, M. Debierne discovered actinium, a radioactive substance contained in pitchblende. The effects produced by the rays produced from radioactive substances are chemical, fluorescent, physiological or electrical. The rays produced are powerful enough to kill the germinating power of seeds. Their effect on the skin is to cause a burn somewhat similar to that produced by X-ray.

Sir Ernest Rutherford, the distinguished British physicist who engaged in extensive researches on radium and other radioactive substances, showed that the discharging effect produced by uranium rays was due primarily to the production of ions in the volume of gas through which the rays pass. The ions which exist in these gases are in general identical with the ions produced by X-rays. To Rutherford one must credit the disintegration theory, which to-day is generally accepted by the world of science. Under this theory the atoms of radioactive bodies are subject to disintegration. This disintegration process is a continuous violent process, in that a disintegrating atom discharges particles that make up the radiation and from this atom emerges a new atom which undergoes the same process until such time as only stable atoms result. Rutherford's theory also holds that any energy liberated by a radioactive substance is liberated at the expense of the internal energy of atoms. It would follow, then, that the energy contained within atoms is greater than that energy contained in the molecular heat motion of matter.

Science has disclosed through its study of radioactive substances and X-rays that every atom of matter is composed of a minute positively charged nucleus, which is surrounded in other parts of the atom by a sufficient number of negative electrons to neutralize the positive charge on the nucleus. Radioactivity is important in that it shows that the heaviest elements are unstable and are spontaneously changing themselves into lighter elements by dis-Alpha and Beta particles.

Early in January, 1934, Frederick Joliot and his wife, Irene Curie Joliot, daughter of that distinguished scientist Mme. Curie, working at the French Institut du Radium in Paris, announced a new development in the field of atomic physics, the discovery of how to induce radioactivity in elements usually nonradioactive. Physicists the world over immediately set to work in their laboratories to duplicate the accomplishment, the results of which became known a few months later. M. Joliot and Mme. Curie themselves made a follow-up experiment which proved that a real transmutation of elements had occurred. In the original experiment M. and Mme. Joliot projected a stream of alpha particles from polonium against a target of boron and discovered that positively charged particles were being spontaneously shot away in the boron. Physicists in analyzing the process explained that helium nuclei were incorporated into the nuclei of the boron. "This would form a variety of nitrogen atom, but one so unstable that after a few moments a positron, or positive electron, would be emitted, transforming the atom into carbon." Each and every nitrogen atom would not collapse at the same time, and thus the process would continue in the boron target for several minutes. In the follow-up experiment of M. Joliot and Mme. Curie, the two scientists irradiated a small amount of the chemical compound, boron nitrid. Ammonia gas was produced by heating the boron nitrid with caustic soda. It was clearly shown in the tests which were made that the artificial radioactivity had forsaken the boron and travelled with the ammonia, the "positive chemical proof that the struck boron atoms had been turned into nitrogen, for ammonia is a compound of nitrogen and hydrogen and has no boron in it."

The three original elements which have been successfully activated are boron, magnesium and aluminum. Several important experiments have been conducted, however, and are still under way, which have and will probably produce radioactivity in ordinarily non-radioactive elements. At the California Institute of Technology, Drs. Charles C. Lauritsen, H. Richard Crane, and W. W. Harper have been successful in producing artificial radioactivity in carbon. Carbon was bombarded with dentons, the nuclei of heavy hydrogen atoms. Radioactivity is measured by the "half period," the time required for half of the atoms to be transformed. A more intense radioactive effect was derived from the carbon experiment than had been found with boron and other elements, but the "half period" was only about ten minutes, while the half period of activated boron was about twenty minutes.

At the Cavendish Laboratory, Cambridge, England, Drs. J. D. Cockcroft, C. W. Gilbert and E. T. S. Walton conducted a similar experiment by bombarding graphite (carbon) with protons, or nuclei of ordinary hydrogen. Radioactivity was also produced by bombarding carbon with other elements at the University of California, by Prof. E. O. Lawrence.

During the process of natural radioactivity, the nuclei of atoms are continually breaking down into nuclei of lighter elements. This process takes place at a regular pace, and the "transformation is accompanied by the ejection from the nucleus of material or energy not needed in the lighter element." The "half period" of radium, which is 1,580 light years, or uranium, 45,000,000,000 light years, is extremely long as compared with the "half period" of elements in which radioactivity has been artificially produced. Other natural radioactive elements, however, have much shorter "half periods" than boron, carbon, magnesium, aluminum or graphite. Radium A, for instance, has a "half period" of 3.05 minutes; thoron, fifty-four seconds, and thorium A, 0.14 second.

The attention of medical scientists has been drawn towards the new development in atomic physics. At the present time, radio-active materials in use in hospitals, is radium emanation, the "half period" of which is approximately four days. Three rays are emitted from radium: (1) a stream of positively charged 'alpha particles' now identified as the nuclei of helium atoms; (2) high speed electrons and (3) gamma rays. It is the gamma rays which are so valuable in the field of medicine. In the event that the new radioactivity proves as useful as radium in the treatment of disease, particularly cancer, the discovery of artificial radioactivity will prove most valuable. It yet remains to be determined whether the medical effect of the streams of positive electrons emitted during the process of artificial radioactivity can take the place of gamma rays, or whether these electrons have some therapeutic effect of their own.

See CHEMISTRY; CURIE, MME.; CURIE, PIERRE; RADIUM.

Radio Broadcasting, one of the major systems of communication in operation throughout the world to-day which has presented an almost astounding development during the past twenty years. According to the reports issued by the United States Bureau of Foreign and Domestic Commerce there were, in 1933, 17,611,138 radio receiving sets in North America alone, while Europe boasted of 15,886,306 such sets in operation. It was estimated that there were 36,774,807 radio receiving sets throughout the entire world in that same year. The United States Department of Commerce returned an estimated value of these radio receiving sets as $1,235,578,000. A report of the Columbia Broadcasting System returned an estimate of 16,809,562 radio receiving sets in homes in the United States in 1933.

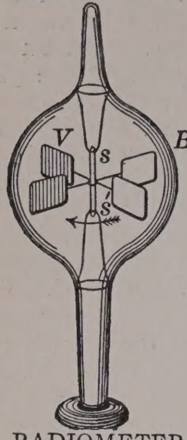
On January 1, 1932, there were 1,423 radio broadcasting stations throughout the world. Of this total, the United States maintained the lead in possessing 617 broadcasting stations. The remaining stations were divided among seventy nations. In twenty-nine countries of the world, including the United States, any eligible party is permitted to broadcast. Twenty countries have made broadcasting a monopolistic concession, while two nations have succeeded in combining broadcasting systems with certain other desirable facilities to make a monopoly. The cost of radio broadcasting in the United States, according to the report of the Federal Radio Commission in 1931, totalled $77,995,405. This total included amounts paid by the NBC, the CBS, the Don Lee, and the Yankee systems as well as 571 individual stations. The chain companies, which include the National Broadcasting Company, the Columbia Broadcasting System and the Yankee network, showed an actual invested capital of $11,034,203. Independent stations had, in 1931, a total capital investment of $36,845,045. The total investment of 571 stations was returned as $47,879,248.

Police radio service has shown a decided increase since the first assignment of frequencies to police service in April, 1930. In April, 1931, there were twenty-nine cities in the United States operating police radio service stations. In June, 1932, there were ninety-two such stations either licensed or under construction throughout the country. It has been estimated that emergency calls transmitted to police automobiles require but an average of one minute, two seconds to broadcast. This service has proved of inestimable value in making arrests and retrieving stolen goods.

In 1934 a new signal code for ships was put into operation by which ships signalling by means of either flags or radio benefitted. The new code was formulated following the international conferences which were initiated in Washington, D. C., in 1927. It has been translated into English, French, German, Japanese, Italian, Norwegian and Spanish and put into operation throughout the entire world.

See TELEPHONY; RADIO.

Radiometer (*ra-di-om'e-ter*) **Simple,** a device invented by Sir William Crookes in 1873. Its essential features are a windmill of four light mica-vanes placed in a glass tube B from which most of the air is exhausted. The vanes are blackened on one side. Black absorbs heat, white reflects heat. So when sunlight or electric light falls on the instrument, the blackened sides are more heated than the others, expanding the air behind and driving the vanes as indicated by arrow.



RADIOMETER

Rad'ish, a name applied to species of *Raphanus*, a genus of the mustard family, and especially to *R. sativus*, long cultivated, principally for its fleshy roots. It is native to the Old World and many garden varieties have been developed, which may be classed in general as long-rooted and turnip-rooted varieties.

Ra'dium is an elementary metallic substance, so called because it emits rays which render luminous sensitive objects on which they are thrown. It was discovered by Professor Pierre Curie of Paris University and Madame Sklodowska Curie, his wife.

Radium is present in very small quantities in ores containing uranium, the most important being pitch-blend, found in Austria, Sweden and England; carnotite, in Colorado and Utah; autunite, in France, Portugal, etc. The tremendous cost ($120,000 per gram, or 15 grains, of radium element), is due to the long and tedious process necessary to extract the very small amount present in the ore. To produce 2 to 5 centigrams (about ⅓ to ¾ grains) requires 1 ton of ore, 5 tons of chemicals and 50 tons of water.

Radium, and other like substances, possess what is known as radio-activity, caused by a spontaneous disintegration of the atoms, somewhat akin to an explosion. This property manifests itself by certain phenonema, as the generation of heat, electricity, the evolution of an active gas, the projection of invisible and penetrating rays, and by light. When a tube containing a radium salt is taken into a dark room it glows with a beautiful soft radiance. Radioactive substances also cause electrified bodies to discharge their electricity; they excite phosphoresence in certain minerals, as willemite, zinc sulphide and the diamond; they act upon photographic plates in a manner similar to ordinary light and the X-rays. Their rays penetrate substances opaque to ordinary light, even passing through a half inch of steel, a foot of solid iron or six inches of lead; and finally, they cause certain changes in the tissues of the body.

The first product of the disintegration of radium is a gas called the "emanation," which in turn, step by step, changes into other elements, called radium A, radium B, etc. This is the transmutation, or conversion of one element into another, hitherto believed impossible. During these changes three kinds of rays are produced, called alpha, beta and gamma. The alpha rays are atoms of helium having charges of positive electricity and are projected with a velocity 1-20 that of light. Their flight can be observed through an instrument called the spinthariscope. The beta rays are atoms of negative electricity or electrons (see ATOM), while the gamma rays are pulsations transmitted through the ether with the velocity of light.

In spite of the fact that a grain of radium bromide expels every second about ten thousand million alpha-particles, it has been estimated that it would take many thousand years before the complete disappearance of the salt.

Many extravagant claims have been made that in radium has been found a cure for cancer. These claims I have carefully considered and with Dr. William Seaman Bainbridge, Surgeon to the Hospital, I have spent much time at the medical centers abroad that are testing radium. My conclusions are, that while of great benefit in certain forms of cancer, there is but one universally recognized cure—the *early* use of the knife. It will take years of careful study to determine the true value of radium in the treatment of cancer. It has proved beneficial in the treatment of superficial cancer, lupus, keloid and kindred conditions.

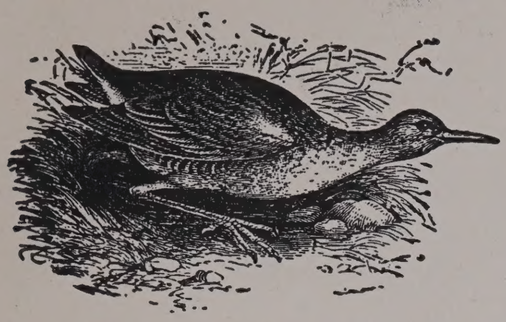
WORTHINGTON, SEATON RUSSELL, M. D.
Research Fellow and Chief X-Ray Department,
New York Skin and Cancer Hospital.

Rae (*rā*), **John,** Arctic traveler, was born near Stromnes on the Orkney Islands, north of Scotland, in 1813, and, after studying medicine at Edinburgh, went to Hudson Bay as physician of the company's ships. In 1845 he undertook an exploring expedition and in 1846–7 a more extensive one, wintering in Repulse Bay. He was second in command on a search-voyage for Franklin in 1848, and five years later commanded an expedition that proved King William's Land to be an island. In his journeys he traveled more than 1,800 miles over regions never before explored. He died at London, July 24, 1893.

Raf'fia is a strong, supple fiber, obtained from the jupati palm, native of South America, and from allied palms in India and Africa. Raffia is extensively used in nurseries and gardens for binding plants and young trees to stakes, that they may grow erect and produce better fruit by greater sunlight being thus afforded. Raffia is also used extensively for mats and even for clothing. Its fiber, though coarse, is very strong and durable.

Raikes, Robert. See SUNDAY-SCHOOLS.

Rail, any one of a group of shore-birds found in marshes. They have the habit of skulking, instead of taking to wing, when pursued, and, therefore, are more frequently heard than seen. They are extremely shy. They have slender bills and long powerful legs; are small or of medium size; the body is wedge-shaped, allowing the creatures to make their way through close, marshy undergrowth. Although the wings are short and rounded, the birds in their migrations cover great distances. They are united with the coots into one family, but the toes of the rails are completely divided, those of the coots are lobed. The Carolina rail or sora is the most common one in the United States. It is found in the whole of temperate North America, but is more abundant east during migration, as it breeds chiefly in the northern part of its range. It is about eight and one half inches long, with the upper parts olive-brown, streaked with black; the breast is slaty and the belly white. The Virginia rail also is common. The king-rail or freshwater mud-hen is the largest and finest of the American true rails, being about 17 inches long. It is common in some sections of the United States. The yellow and the black rails are less common. The common water-rail of Europe is found in marshy districts of the British Isles and many parts of Europe. Like the American rails, it nests in the grass.

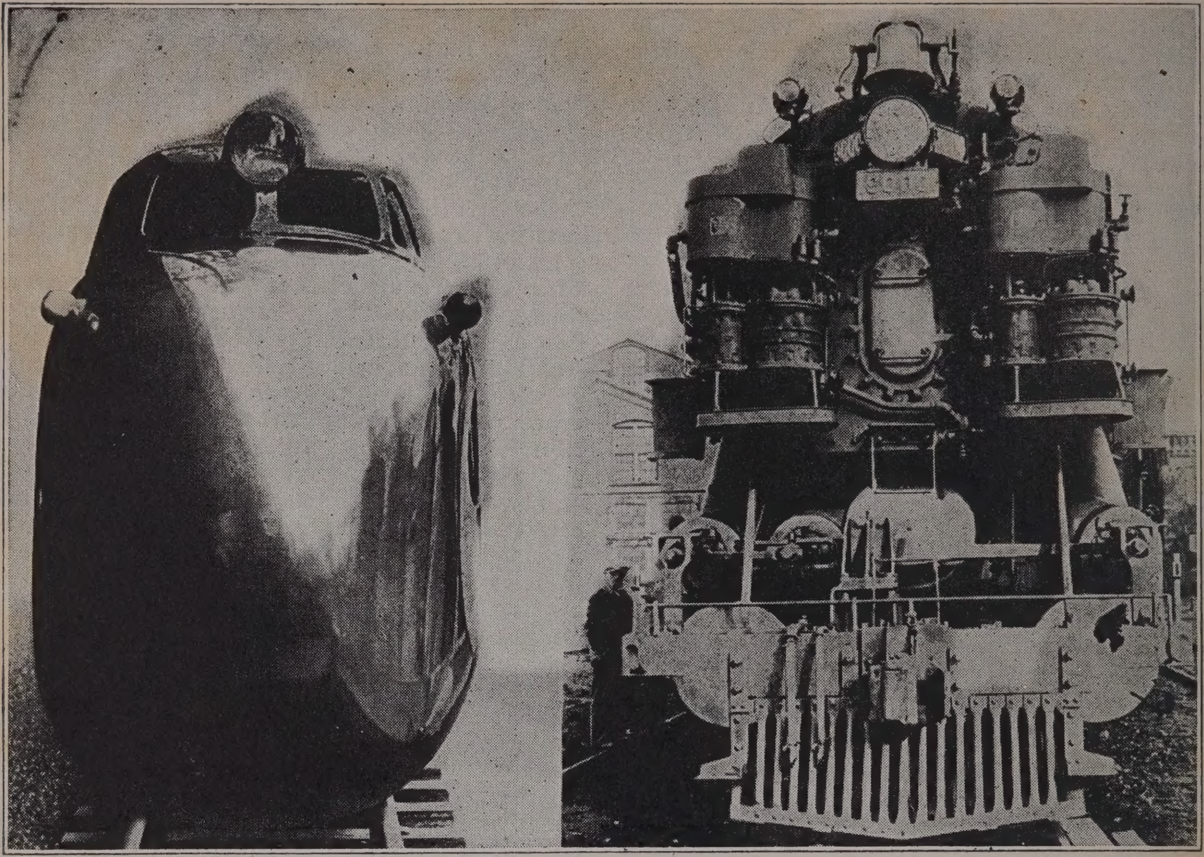


RAIL

Rail'roads'. The origin of these mighty agents of commerce and civilization may be traced to a contrivance for carrying coal from the mines in Northumberland and Durham, England, to the places of shipment on the Tyne and Wear. It consisted of two parallel lines of wooden beams or trams fixed to the ground and furnished with flanges to prevent the wheels of vehicles from slipping aside. The date of the invention of these tramways is not certain, but it may be safely referred to the first half of the 17th century. The first step in improvement, which was covering the wooden beams with long strips of iron, was taken about 1700; and a second and more important improvement which followed some years afterwards was the substitution of cast-iron rails fixed on wooden sleepers laid crosswise. This kind of railway became pretty general in mining districts during the 18th century; but on account of the opening of canals and from other causes it was not considered practicable as a general means of travel and transportation. After the introduction of cast-iron rails, instead of a single wagon the plan of linking several smaller wagons was adopted. This was the germ of the modern railway train. The next improvement consisted in putting flanges on the wheels instead of the rails, which secured much greater facility of transit. But, as no more rapid or powerful means of locomotion had been invented than horse-power, many persons labored to devise some sort of steam apparatus for the purpose. The merit of inventing a self-acting steam carriage is due to Richard Trevethick, who in 1802 took out a patent for a steam locomotive which successfully drew wagons on rails. Trevethick's invention, however, was too imperfect to come into general use, and for a few years little or no improvement was made upon it, chiefly on account of the mistaken notion among engineers that the steam locomotive could not be made to draw a heavy load or acquire great speed unless it were provided with cogged wheels to work on a corresponding rack along the rails. That locomotives with smooth wheels running on smooth rails could draw heavy loads even up a moderate incline was established by Mr. Blackett, a coal proprietor on the Wylam Railway, in 1811; and nothing was now lacking but the means of obtaining speed.

Locomotive power was first employed by George Stephenson in 1814 on the Killingworth Railway, and with such success that it was afterward applied on the Stockton and Darlington Railway, which was the first railway in which carriages for passengers were used; but for some time its trains could not be made to move much faster than a horse walking. Stephenson, after a number of experiments, overcame this difficulty by sending the waste steam up a chimney, so as to cause a powerful draught in the fire. A rapid generation of steam was the result, and from this device, in connection with the multitubular boiler, the locomotive of the present day, with its wonderful power and energy, has been derived. But it was some time before the public mind could be brought to consider the question of the general use of railways, and it was not until 1830 that the line from Liverpool to Manchester was formally opened.

The first railroad constructed in the United States was in 1826, and was for the purpose of carrying granite from the quarries near Quincy, Mass., to tidewater. a few miles distant, and next year the legislature of Maryland chartered the first



THE NEW AND OLD

A combination picture showing the head-on appearance of the new high-speed Union Pacific passenger train that will do 110 miles an hour (left), and a massive steam locomotive, a 9,000-class triple-cylinder engine, capable of hauling a mile-long freight train.

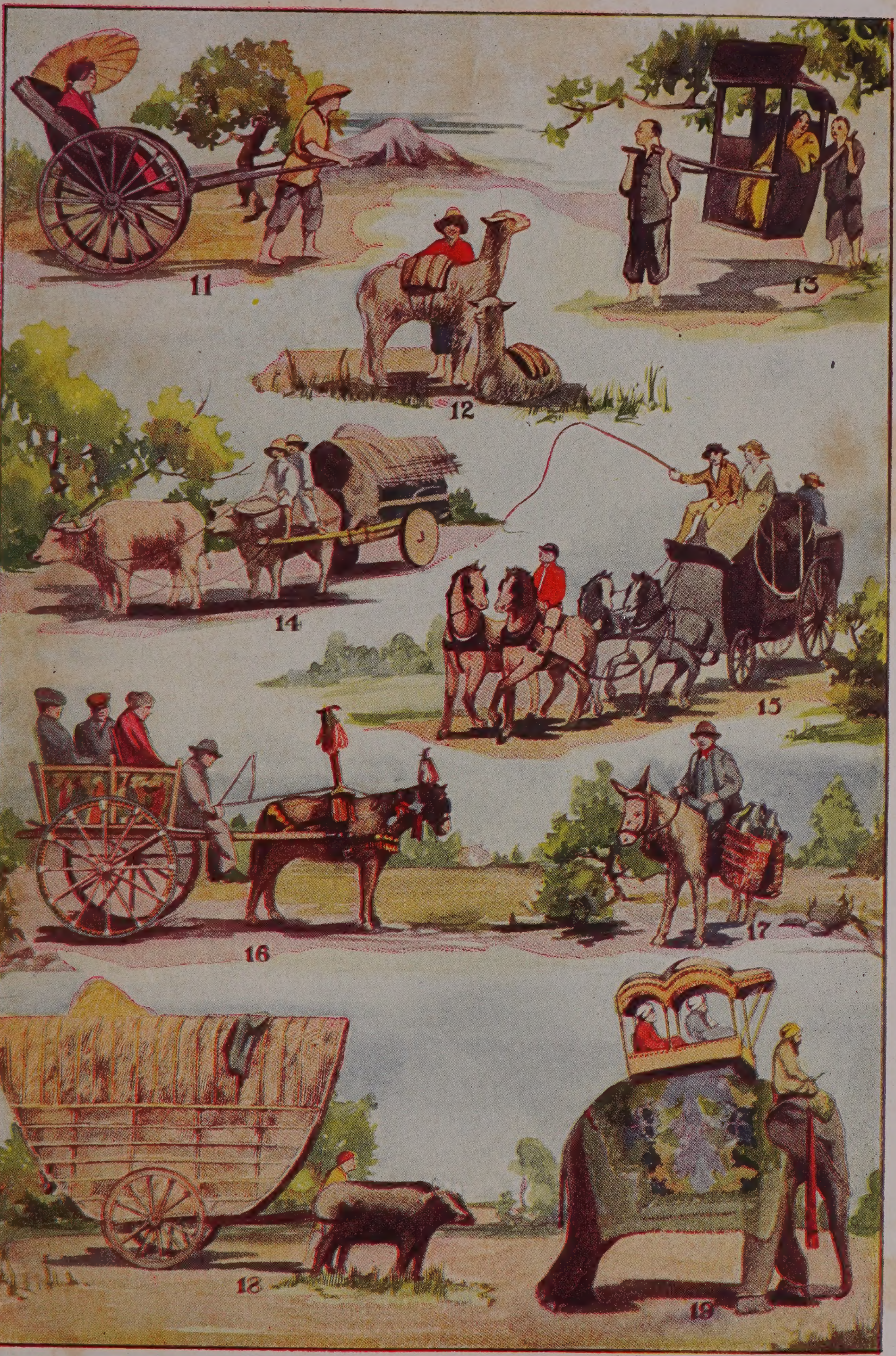
railroad company authorized to do a general business in carrying freight and passengers. This was little more than a hundred years ago, yet such has been the progress in railway enterprise that today there are some 250,000 miles of railway trackage in the country, and in 1920 there were 273,707 miles of railroads in the United States. The development of automobiles and motor trucks, together with good roads, made serious competition for the railroads, and led to the abandonment of some of the less profitable lines. The approximate mileage in the leading countries of the world at the beginning of 1934 was as follows: Russia (U.S.R.R.), 49,000 miles; India, 42,000 miles; Canada, 41,410 miles; Germany, 33,442 miles; France, 26,862 miles; Australia, 26,068 miles; Argentina, 24,424 miles; Great Britain, 24,403 miles, of which over one-half possessed two tracks.

In the United States, the railroads were in such bad condition financially in 1933 that an emergency railroad law was passed by Congress. Under its provisions, Joseph B. Eastman, member of the Interstate Commerce Commission, was appointed Federal Railroad Coordinator. There was marked improvement in the railroad situation and an increase

PULLMAN
CAR & MFG. CORP.
1
RAILPLANE

THE PULLMAN "RAILPLANE"

Above is shown Pullman's contribution to the railroad's fight for increased business. This car is designed to travel ninety miles an hour and seats fifty people. It is driven by two automotive-type engines.



MODES OF TRAVEL IN DIFFERENT COUNTRIES

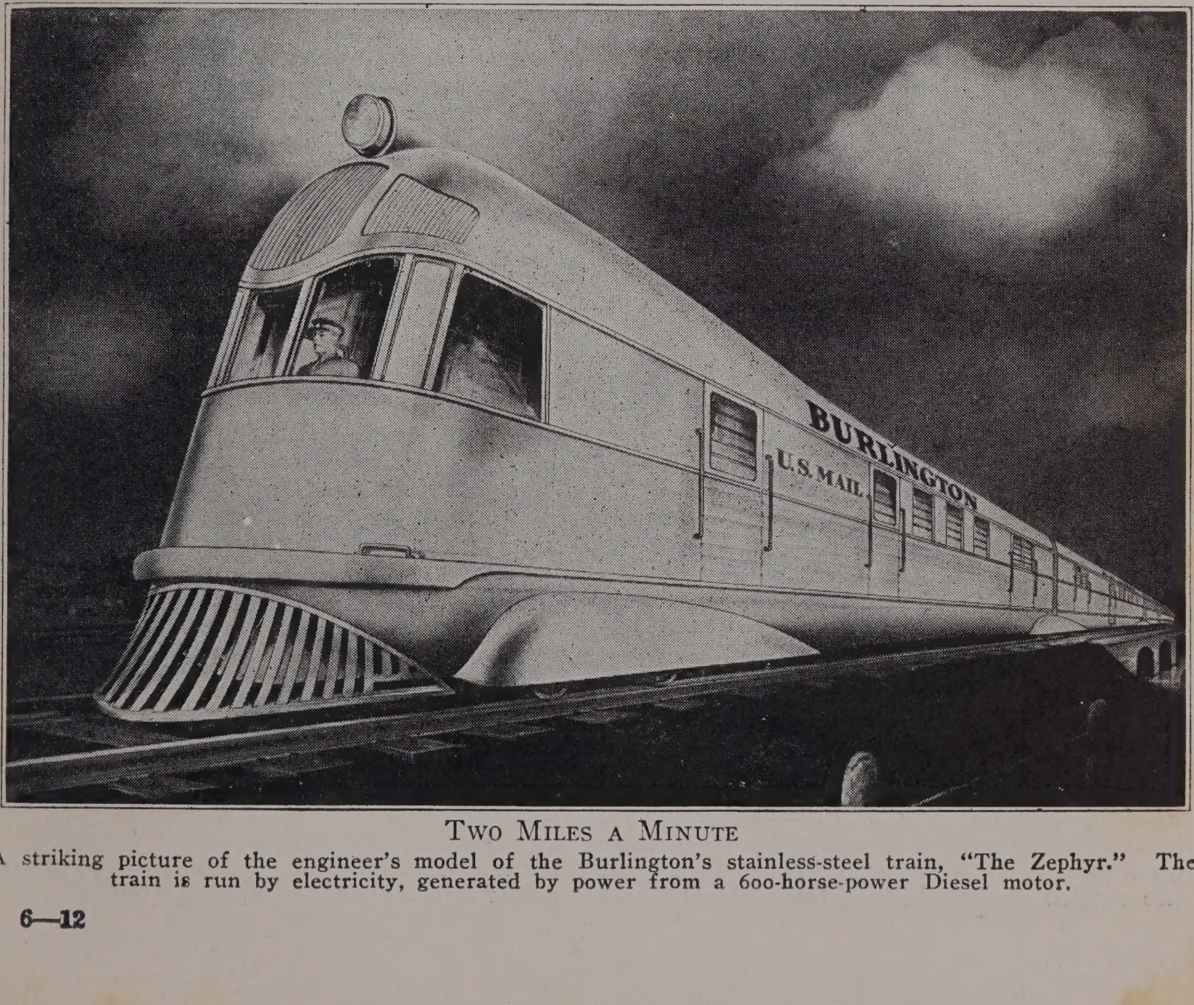
11—Jinrickisha, Japan. 12—Llamas of Peru. 13—Palanquin, China. 14—Tagalog Tandem, Philippines. 15—English Coach. 16—Sicilian Cart. 17—Spanish Milkman. 18—Cart with Bamboo Cover, Borneo 19—Elephant with Howdah, (canopied seat) Siam.

in traffic during the latter part of the year.

To meet the increasing competition of motor trucks for freight, and motor busses for passengers, the railways turned to developing new type trains of lighter weight and greater speed. The passenger carriers were also made much more luxurious than had previously been the custom. All the things which had been learned in airplane manufacture as to wind resistance, stream lines, etc., were applied to the design of these new trains. First in the field was the Union Pacific Railroad, which contracted to have built a three-car train, stream-lined, motor-driven and capable of skimming over the rails at 110 miles an hour. The train consists of three all-metal, light-weight units or cars, closely joined to each other. Tubular construction obviates the necessity for heavy undercarriages necessary to support ordinary passenger coaches. The entire three-car train weighs no more than eighty tons. That is the weight of the ordinary Pullman sleeping coach. The average speed is ninety miles an hour, but on level stretches it can be increased to 110 miles an hour. Excess weight is eliminated also by utilizing modern light - weight metals for construction material. Alloys of aluminum are now produced which have the strength of steel with one-third the weight, and stainless steel is three times as strong as ordinary steel and therefore only one-third as much needs to

LUXURY FOR MODERN TRAVELERS

An interior view of the Clark "Autotram," constructed at Battle Creek, Michigan. This car is equipped as a club lounge with aluminum furniture and special lighting.



TWO MILES A MINUTE

A striking picture of the engineer's model of the Burlington's stainless-steel train, "The Zephyr." The train is run by electricity, generated by power from a 600-horse-power Diesel motor.

be used. Stream lining is carried to a finer point than was ever attempted before in Europe or America. Air conditioning is used throughout the train. The train is powered by a 600-horsepower internal combustion engine placed in the first car. The engine uses a distillate, a non-explosive fuel, and is connected directly with an electric generator and motors on the wheels of the forward truck.

Not to be outdone, the Burlington Route (Chicago, Burlington and Quincy) ordered construction of another and somewhat similar train. This train is powered by a Diesel engine. It also is stream-lined and is built for speed, service and economy.

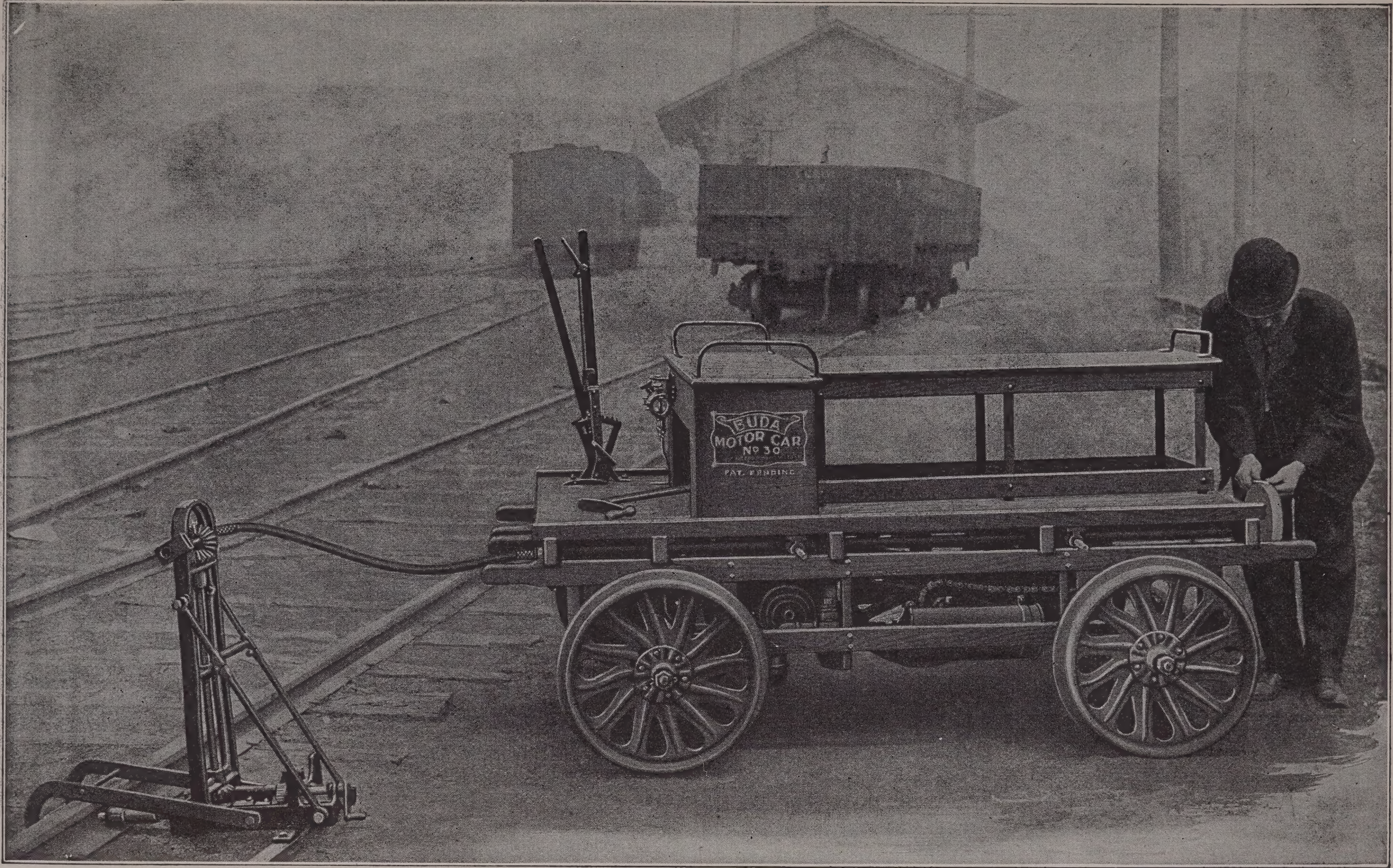
Since the World War, there has been much agitation in favor of consolidating the railroads of the country into a limited number of major trunk lines, with contributing branches. Difficulty has been experienced, however, in bringing this project to consummation because of a diversity of ideas as to the best method of procedure. It was considered likely, at the beginning of 1934, that the lines running between New York and Chicago would be merged into not more than five nor less than four systems. Similar consolidations were being perfected for railway lines in other parts of the country.

See Locomotive; Pullman.

Rain is caused by whatever lowers the temperature of the air and causes a part of the watery vapor, with which it is saturated, to assume the liquid state. Various causes may conspire to effect this object, but the most important of these originate in winds and other movements of the atmosphere. The more important principles regulating the relation of the winds to the rainfall are these: (1) When the winds have traversed a considerable extent of the ocean before reaching land, the rainfall is large; (2) when the winds, on arriving at the land, advance into higher latitudes or into colder regions, the rainfall is greatly increased because the air is brought below the point of saturation more rapidly; (3) if the winds, on arriving at the land, at once advance into warmer regions, the rainfall is small; (4) if the winds travel across a range of mountains, the rainfall is largely increased on the side facing the winds but reduced on the other side. There are certain places where rain rarely or never falls, as the coast of Peru in South America, the great valley of the River Colorado in North America, the desert of Sahara in Africa and the desert of Gobi in Asia; while, on the other hand, in such regions as Patagonia it rains nearly every day. In all places within the tropics where the trade-winds are blowing regularly and constantly rain is of very rare occurrence, the reason being that, as these winds come from a higher latitude, their temperature is increasing and consequently they take up moisture rather than part with it; and the return trade-winds, which blow above them in an opposite direction, having previously parted with their moisture, are dry and cloudless. When, however, these winds are forced up mountain ranges, as is the case on the east of Hindustan, they bring rain, which falls chiefly during the night, when the earth is coolest. In respect to rainfall Europe may be divided into two distinct regions — western Europe and the countries bordering on the Mediterranean. As the southwest winds, which are the return trades, descend to the earth and blow over the surface of Europe, it follows that the western parts, especially where mountain ranges stretch north and south, are rainy districts Hence the rainiest regions of Europe are Norway, Ireland, the west of England and France, and Spain and Portugal On the coast of the Mediterranean it rarely rains in summer, but frequently in winter. In Italy the quantity diminishes as we approach the south; and south of the Alps six times more rain falls with the northeast than with the southwest winds, the exact reverse of the case in England

The manner of the distribution of rain in the United States is very different from what it is in Europe. The Rocky Mountains in North America are so high as to present an effectual barrier to the passage of the trade-winds which blow over the Gulf of Mexico, by which means they are turned northward and spread themselves over the country, especially the low basin of the Mississippi. When they have blown for some time, vast accumulations of heat and moisture take place, and sometimes great storms arise in consequence, sweeping eastward across the land and in many cases crossing the Atlantic and descending with violence on western Europe. It appears, in short, that the south winds from the Gulf of Mexico spread the moisture over the country, and the northwest winds separate this moisture from them by getting below them and forcing them into the higher regions of the atmosphere. As a consequence of this the heaviest rainfalls are in the valleys and the lightest on higher grounds. Thus the greatest amount of rain falls in Florida, the low flats of the Mississippi and along its valley, and the least quantity on the Alleghanies, especially on their higher parts, and on the high grounds of the Missouri River. In the northern states the quantity diminishes considerably, and the mode of its distribution is more similar to that of Europe.

Rain'bow', an optical phenomenon of great beauty appearing in the sky when rain is falling from clouds opposite the sun. It consists of a number of concentric arcs whose successive colors are arranged in the same order as the colors of the solar spectrum. There usually are two bows: an upper and a lower. The lower one is always



SECTION MOTOR CAR, replacing ordinary hand car. It not only transports section men, but it is also a portable machine shop. Removed from the track, the engine can drive power shafts while the car stands at rest. It drills holes in rails, operates a wood or metal saw, riveting tools, a concrete mixer, etc. Eight tools can be operated at one time.

the brighter and is called the *primary* bow; the upper is often very faint, and is called the *secondary* bow. In the primary bow the colors begin with red at the top and end with violet at the bottom; in the secondary bow the order is just reversed.

The explanation of the rainbow was first given by Antonio de Dominis, archbishop of Spalatro, about 1600 A. D., who showed that a glass sphere filled with water would reflect a parallel incident beam of light in such a way as to produce a complete rainbow on a screen surrounding the source of light; but this explanation was, of course, incomplete until Newton proved that color is not produced at the refracting surface but is due to the decomposition of white light. This experiment of Dominis can be repeated by going into the Cave of the Winds at Niagara Falls where, on a bright day, the parallel incident beam and the complete rainbow of 360° are easily obtained, the particles of spray replacing the glass-bulb filled with water. The primary bow is produced by rays which have undergone *one* internal reflection; the secondary by rays which have suffered *two* internal reflections. The angular width of the primary bow is twice 42° 2′ for the red rays; and twice 40° 17′ for the violet rays. The corresponding angle for the red rays of the secondary bow is 50° 57′; and for the violet rays 54° 07′. For the details of the reflections and refractions here occurring see any good textbook of physics, as Watson's.

Rain-Gauge, an instrument employed by meteorologists to measure the depths of water deposited by rain during any assigned period. In its ordinary form it consists of a funnel, with a mouth of known area, for collecting the rain-water in a graduated glass vessel where its mass can be easily determined. Knowing the mass of water precipitated and the area over which it was distributed, the depth may be easily calculated. Several forms of self-registering rain-gauges have been devised, for which see any good treatise on meteorology.

Rainier (*rā′nēr*), **Mount.** This mountain is in the southwest of the state of Washington, in the Cascade Range. It is higher by 10,000 feet than the surrounding mountains, from which it rises in an almost perfect cone to the height of 14,526 feet above sea-level. Its crater still gives out sulphurous fumes, but the deep gullies that the waters have worn in its sides and the mighty forests that surround its base show that the last eruption was in some far distant time. No less than 14 glaciers move slowly down its sides; and the ascent is very difficult. The mountain is also called Mount Tacoma. In height it is second only to Mount Whitney among the mountains of the United States, south of Alaska.

Rain′y Lake, a lake forming part of the boundary line between the Canadian Dominion (province of Ontario) and the United States. It lies 100 miles west of Lake Superior, and is about 55 miles in length. It discharges its waters through Rainy River into Lake of the Woods.

Rainy River, a town on the river of the same name and the main line of the Canadian Northern Railway. It is the first divisional point on that line east of Winnipeg, and is important as the center of the sawn-lumber industry. The timber on the American and Canadian sides of the river is floated to this point to the mills. The Rainy River Lumber Company employs 450 hands. The Rat Portage Lumber Company employs 200 hands. The town has steamboat connection with Kenora and Fort Frances. Population 2,500.

Rai′sins, dried grapes of various kinds and well-known in the market. The raisin industry has long been developed in the Old World, but has recently become an important industry in California.

Rajah (*rä′jä*) is a Sanskrit word meaning king. Originally it was a title given to princes of the Hindu race who governed a territory, whether independent or not. Now the title is given to all Hindus of rank; even landowners of inferior caste not infrequently are given or assume the title. Native princes now as a rule assume the title of *maharajah*, meaning great king.

Raleigh (*ra′lĭ*), **N. C.,** capital of North Carolina and named after Sir Walter Raleigh, is situated on Neuse River, a little less than 200 miles from Richmond. It is built on an elevated site, with a central Union Square, from which four principal streets radiate, each 100 feet wide. In the square stands the capitol, a large granite building, costing over $500,000. The city also contains other state institutions and various manufactories. These consist of flour, cotton and cottonseed-oil mills, car and machine shops, phosphate, agricultural implements and carriage works and foundries. Raleigh has splendid public schools, both for colored and for white pupils, the state College of Agricultural and Mechanic Arts, the state institutions for the blind (white and colored), and the state Deaf and Dumb School. Near the city is the state university. Raleigh has the service of four railroads. Population 40,000.

Raleigh, Sir Walter, was born at Hayes, Devonshire, England, in 1552. He entered Oriel College, Oxford, in 1566 but left in 1569, without taking a degree, to serve in the Huguenot cause in France. In 1580 he distinguished himself in the suppression of the Irish rebellion in Cork, and two or three years afterward was introduced to court and became a favorite of Queen Elizabeth. Raleigh's tall and handsome figure, his dark hair, lofty forehead, resolute bearing, alert expression and spirited wit combined to form an imposing personality, and all the advantages that nature had given him were heightened by a gorgeous splendor in dress and jewels. But, as he was proud, haughty and impatient, he made hosts of enemies and was never fully admitted to the queen's counsels in reference to matters of state. The playful name of Water, which she applied to him, would indicate that she appreciated that instability of character which was his great fault and in the end worked his ruin. She, however, lavished numerous favors upon him throughout her reign, permitting him to send out and command various expeditions to the New World. His vessels scoured the seas in privateering enterprises, which at once gratified his inborn hatred of Spain and helped to provide the means for his various ventures in Virginia. Raleigh was in Ireland when the Armada (1588) appeared in English waters; but he hastened to the south of England to superintend the coast defense, and was present with the fleet throughout that week of toil and triumph. In June, 1596, he sailed in the expedition under Howard and Essex to Cadiz, and it was his counsels that governed the whole plan of action that for a second time shattered the naval power of Spain. Raleigh continued to enjoy the favor of Elizabeth until her death in 1603; but James I came to the throne with deep-seated prejudices against the gallant courtier, and in a short time stripped him of his offices. Raleigh was also arrested and tried for taking part in a conspiracy against the king's life, the only witness against him being the miserable Lord Cobham, who made and unmade his eight different charges with such facility as to make them of no value at all. "But one thing," says Kingsley, "comes out of the infinite confusion and mystery of this dark Cobham plot, and that is Raleigh's innocence." He was, however, condemned to death, and only on the scaffold was his sentence commuted to imprisonment for life. After remaining in London Tower for 13 years Raleigh was released for the purpose of leading an expedition to the Orinoco River, in search of a gold-mine, which, he said, existed there. He pledged himself not to come into collision with Spain; but some of his men, while he was sick aboard his ship, attacked a Spanish village and burned it to the ground. Raleigh returned to England without finding the mine, and was reärrested and executed under the sentence which had never been revoked. The speech he made on the scaffold was a masterpiece of eloquence. "As he stood there in the cold morning air," says Mr. Gosse, "he foiled James and Philip at one thrust, and conquered the esteem of all posterity." He asked to see the axe, and, touching the edge, said: "This is a sharp medicine, but it is a sure cure for all diseases." His *History of the World*, written during imprisonment, was a monumental work. He was executed at London, Oct. 29, 1618.

Ralph, Julian, an American journalist, war-correspondent and author, was born in New York City in 1853. His journalistic career was very brilliant. He served in turn on the staff of the New York *Daily Graphic*, the New York *Sun*, the New York *Journal* and the London *Daily Mail*. He was present during the Greco-Turkish War in 1893 and the Boer War in 1899. He died in 1903. Mr. Ralph is the author of the following works as well as of numerous shorter contributions to magazines: *On Canada's Frontier; Our Great West; Dixie; Alone in China;* and *Towards Pretoria.*

Ram, an ironclad ship with a heavily-armored stem, projecting in the form of a beak below the water-line, intended to run into and sink an enemy's vessels. In action the ram is propelled at full speed against her antagonist, and, if she succeeds in striking her fairly, the blow is supposed to be sufficient to crush in her side and sink her immediately. The ram was first employed during the Civil War in the action at Norfolk Roads in 1862, when the Federal frigate *Cumberland* was sunk by the Confederate ram *Virginia.*

Rama (*rä'mä*), in Hindu mythology, is the name common to three incarnations of Vishnu as Parasurama, Rama-chandra and Balarama. See VISHNU.

Ramayana (*rä-mä'yȧ-nȧ*) is one of the two great epics of India, the other being *Mahábhárata.* Its subject is the story of Ráma, and its reputed author is Valmiki, who is said to have taught his poem to the two sons of Ráma. Although the statement is doubtful, it is certain that Valmiki was a real personage and that the *Rámáyana* was not, like the *Máhábhárata*, the creation of different minds at various epochs. As a poetical composition, the *Rámáyana* may safely be called the great poem of India.

Ramée, Louise de la (known by her pen-name of Ouida), English novelist of French extraction, was born at Bury St. Edmunds in 1840. Little is known of her early life or education beyond the fact that she was brought up in London, where she began in the sixties to write for Colburn's *New Monthly* and other magazines. Her pen-name was, it is said, suggested by the efforts of a child-sister to call her Louise. Her first novel, *Granville de Vigne*, appeared in book form in 1863, and she was a most industrious and prolific writer. Her novels dealt with all phases of European society, some of her themes being treated with cleverness and skill, often with cynical railing at the weaknesses of her characters. Her early stories were extravagantly romantic; but she shed her passionate exuberance and became stronger as a writer, though inclined to the reckless and tragic. She for 30 years made her home in Italy, where the scenes of many of her novels are laid. Her best-known stories are *Under Two Flags,* *Othmar*, *Moths* and *Wanda*. She died on Jan. 25, 1908.

Rameses (*răm'ê-sēz*), Egyptian monarchs of whom two, the first and the second, were especially famous. It is usual to identify the warrior-king Rameses II with the Pharaoh who oppressed the children of Israel so sorely and Rameses III with the Pharaoh of the Exodus, although there is considerable difficulty in the identification. The mummy of Rameses II was found in 1881 and that of Rameses III in 1886.

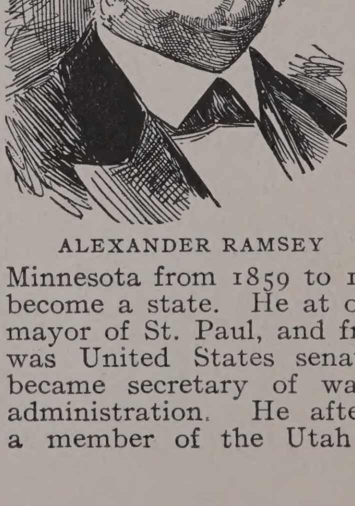
Ramession or **Ramesseum.** The Ramession was built by Rameses the Great in the 15th century B. C. on the opposite bank of the Nile from Luxor and Karnak, and nearly as large as the former. It is the only temple entirely constructed under the reign of one king. The Ramession is in a bad state of ruin, and very little has been left even of its material; but it still is quite easy to trace the general plan Two great pylons flank the main entrance; the two are 226 feet wide but the upper part is gone. This opens into a peristylar court which formerly had a double colonnade on two sides at least. A colossal statue, 56 feet high, of Rameses seated is at the further end facing backs of pylons Another court, grander than the first, with porticos to left and right, each having a double range of columns, is adjoining. The entrance to this is effected through a grand doorway. Osirid figures, 31 feet high, formed a row on each side of the entrance; many still remain. Next to this is a vestibule which is reached by three flights of steps; this is ornamented by two colossal busts of Rameses and a row of columns. From this three large doorways of black granite lead to the hypostyle hall, which measures 136 feet wide and 103 feet long. Forty-eight columns support the roof, with the mode of lighting the same as that at Karnak. The ceiling is painted blue with golden stars. Beyond the hall are wide chambers, each having a roof supported by eight columns. Back of these are smaller chambers with only four columns. Around these are gathered still smaller rooms which have been suggested by some as having been used by students that came to the Ramession to study. There is supposed to have been a library here also.

Ramillies, (*rȧ'mē̆'yē̄'*), a village of Brabant, Belgium, is memorable as the place near which, on May 23, 1706, the French forces under Villeroy and the elector of Bavaria were defeated by Marlborough. This victory compelled the French to give up the whole of the Spanish Netherlands.

Ram'say, David, an American physician and historian, was born in Lancaster County, Pa. April 2, 1749, and, after graduating at Princeton College, studied medicine and entered upon practice at Charleston, S. C., two or three years before the Revolutionary War. After the capture of Charleston by the British he was kept as a hostage at St. Augustine for nearly a year; and at the close of the war was chosen a member of the Continental Congress. Besides medical essays and other works he published a *History of South Carolina* and a *History of the American Revolution*. Dr. Ramsay was a member of the South Carolina legislature for several years before his death, which took place at Charleston, S. C., May 8, 1815.

Ramsey, Sir William, K. C. B., F. R. S. One of the most interesting chapters in what might be called the romance of science is that which tells how the alchemists of ancient and medieval times originated chemistry (*q. v.*) by their vain search for some process of turning the baser metals into gold. It remained, however, for a great scientist of the prosaic Twentieth Century, Sir William Ramsay, to find that one substance can actually be transformed into another. This he did in 1903, when he demonstrated the transformation of the radium emanation into helium, neon, and probably argon (substances which he had previously discovered), and the more than likely change of copper into lithium and sodium. At the time of his death, which occurred July 23, 1916, he was professor of chemistry at University College, London. He was born in 1852 in Glasgow, and early distinguished himself by finding out new things as to what the air is made of. In 1887 he accepted the chair of chemistry at University College and there, in conjunction with Lord Rayleigh, discovered the new elements argon and helion. In the air he found certain previously unknown elements to which, as is customary he gave Greek names —neon, krypton, and xenon.

Ramsey (*răm'zĭ*), **Alexander,** United States senator and governor of Minnesota, was born near Harrisburg, Pa., Sept. 8, 1815, where, after studying law, he began to practise in 1839, and took part in the following year in the Harrison and Tyler campaign. In 1843 he was elected to Congress in the Whig interest; from 1849 to 1853 he was governor of Minnesota Territory; and again served Minnesota from 1859 to 1863, when it had become a state. He at one time also was mayor of St. Paul, and from 1863 to 1875 was United States senator. In 1879 he became secretary of war in the Hayes administration. He afterwards acted as a member of the Utah and other com-



ALEXANDER RAMSEY

missions. His death occurred on April 22, 1903.

Ranch'ing, the business of cattle-raising in the unsettled regions of the west. The name is derived from *rancho*, Spanish for mess or messroom. The special feature of ranching is that cattle are kept in a half-wild state, being allowed to range over a great deal of ground, such pasture as they can find being their only food. The life of ranchmen, generally called cowboys, is not so wild and free as it once was, but still has great charms for many different classes of young men. The term ranch has come to be applied throughout the west not merely to stockranges, but to all kinds of farms.

Rand, Theodore Harding, D.C.L., was born at Cornwallis, Nova Scotia, on Feb. 8, 1835. Devoting his life to education, he organized the free, public schools both of Nova Scotia and of New Brunswick, and has been principal of Woodstock College and chancellor of McMaster University, in the founding of the latter of which he was largely interested.

Ran'dall, James Ryder, poet-journalist, was born in Baltimore, Md., in 1839. He was the author of numerous poems, collected in one volume in 1908, but the most famous of his compositions is *Maryland, My Maryland.* This war-poem was written in the heat of passion in the Civil War, and its success was instantaneous. Dr. Holmes wrote to Randall that he wished he might have been able to do for his own Massachusetts what Randall had done for Maryland. He died in the early part of 1908.

Randall, Samuel J., American statesman, was born at Philadelphia, Pa., Oct. 10, 1828, and, after spending a number of years in mercantile business in his native city, was elected to Congress as a Democrat in October, 1862. He held this position — being re-elected every two years — to his death, which took place at Washington, D. C., April 13, 1890. After the death of Speaker Kerr in 1876 Randall was elected to fill the unexpired term. He was also chosen speaker of the house in 1877 and 1879. Throughout his congressional career Mr. Randall's ability and integrity were conceded by men of all parties, and he was held in the highest esteem by his fellow-congressmen. He was a Democrat who upheld protection.

Ran'dolph, Edmund J., an American statesman, was born at Williamsburg, Va., Aug. 10, 1753, and after legal study was admitted to the Virginia bar. In 1776 he helped to frame the constitution of Virginia, and became its first attorney-general. He was governor from 1786 to 1788, and was a member of the convention which framed the constitution of the United States. In 1789 he entered Washington's cabinet as attorney-general, and in 1794 was appointed secretary of state to succeed Jefferson. He resigned in the following year on account of some misunderstanding with President Washington and his colleagues in reference to the Jay treaty. He died in Virginia, Sept. 13, 1813.

Randolph, John, of Roanoke, was born at Cawsons, Va., June 2, 1773. He was a second cousin of Edmund Randolph, and boasted Pocahontas, the Indian princess, among his ancestors In 1799, though only 26, he entered Congress and continued a member, with the exception of two terms, until 1825, when he was chosen United States senator and occupied a seat for two years, during which he fought a duel with Henry Clay In 1830 he was appointed minister to Russia, but returned home next year, and in 1832 was once more elected to Congress. Before taking his seat, however, he died of consumption at Philadelphia, June 24, 1833, having provided in his will for the freedom of his slaves, some 300 in number. During Randolph's long public career he was distinguished alike for wit, eloquence and eccentricity, and was more talked and written about than any public man of his time· many of his sallies and pungent utterances are still quoted.

Randolph, Peyton, was born in Virginia in 1723, and, after studying law in London, was appointed attorney-general of Virginia by the king in 1748. He was president of the continental congress when it first met at Philadelphia in 1774, but resigned on account of ill health. He again took his seat as a member when it reassembled on the 10th of May, 1775, but died at Philadelphia in October.

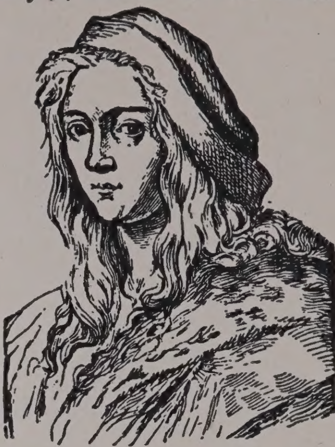
Rangoon', capital of Lower Burma, is situated on Rangoon River, about 20 miles from its entrance into the Gulf of Martaban. The present city is mostly of modern construction, having been built since the English took possession in 1852. The town extends along the left bank of the river, the docks being opposite, at the suburb of Da-la on the other side. A town has existed since the 6th century B. C., but it was called Dagon till taken by Alombra, the Burmese sovereign, toward the end of the 18th century. That prince rebuilt the place, and called it Rangoon. The foreign trade of the annually city exceeds 21 million rupees. Population 289,432.

Ran'jit Singh, founder of the Sikh kingdom in the Punjab of India, was born on Nov. 2, 1780, his father being a Singh chief and the head of one of the 12 military organizations of the Singhs or Sikhs. When he was six, his father died; and at an early age he began to show both a desire and capacity to rule. After the Emir of Afghanistan had given him the province of Lahore, he directed all his energies to founding a kingdom which should unite all the Singh provinces under his personal rule. This object, after many severe conflicts, he accomplished, thus becoming the ruler of an extensive territory, with a well-trained army of 70,000 men. In 1836 his army was totally defeated by the Afghans, but this defeat did not affect his power over any of the territory he had acquired, and his long reign was not disturbed by a single revolt. He died on June 27, 1839. He could neither read nor write, yet his signal ability and energy, united with a rare moderation, are without a parallel in Asiatic history.

Ranke (*răn'kā*). **Leopold von,** one of the greatest of German historians, was born at Wiehe, about half-way between Gotha and Halle, Dec. 21, 1795. Although he studied philology and theology at Berlin and Halle, his chief thoughts were directed to history, for the study and writing of which he possessed a rare genius. His historical works, nearly 50 in number, show remarkable skill in grouping events in proper order and placing them before the reader in so clear and vivid a manner that he can readily see them in connection with all their causes and relations Although Ranke was over 90 when he died, he could not have accomplished what he did, had he not been a man of such great industry and application, with a marvelous memory and excellent judgment as to the value of historical material. Though his style is not brilliant, it is sufficiently clear and interesting. Perhaps the most popular of his works is his *History of the Popes*, so brilliantly reviewed by Macaulay, in the *Edinburgh Review* of September, 1840. Ranke continued to lecture in the University of Berlin until 1872, and died there on May 23, 1886.

Ran'som, Matthew Whitaker, United States senator from 1872 to 1895 and United States minister to Mexico (1895-97), was born in Warren County, N. C., Oct. 8, 1826, and educated at the University of North Carolina. In 1852 he was elected attorney-general of his state, and from 1858 to 1862 was a member of its legislature. In the Civil War he ranged himself on the southern side, and from lieutenant-colonel he rose to be major-general, and was one of those who surrendered at Appomattox. He died in 1904.

Raphael (*răf'â-ĕl*) or **Raffaello Santi** or **Sanzio,** called by his countrymen *Il Divino* or The Divine, is ranked by universal opinion among the greatest of painters. He was born at Urbino, Italy. March 28, 1483, and after the death of his father, who was his first instructor, he was placed under Perugino (*q. v.*) the most distinguished painter of the period, who was then engaged on important works in Perugia. In 1504 Raphael visited Florence where he remained until 1508, and then went to Rome on the invitation of Pope Julius II (*q. v.*). His celebrated frescoes in the Vatican and numerous important works were then commenced. The works of Raphael are generally divided into three classes: his first style, when under the influence of Perugino's manner; his second, when he painted at Florence from 1504 to 1508; and his third style, shown in the works executed by him after he settled in Rome. Each style has its peculiar features and devoted admirers. An admirable example of the first style is the noble *Betrothal of the Virgin*. The great pictures of his second period are the Ansidei *Madonna*, the Grand-Ducal or Pitti *Madonna* and the *Madonna with the Gold-finch*. The supreme creations of his third manner are the wall-paintings in the Vatican, the Sistine *Madonna* and *The Transfiguration*. Those who incline to art employed in the service of religion prefer the first manner, as embodying purity and religious feeling. His last manner, perfected when the taste for classical art and learning was excited by the discovery of numerous works of the classic period, is held by many as correctly embodying the highest art; while his Florentine style is especially admired by some as showing his powers freed from the imitation of Perugino and as yet unaffected by the conventionalism of classic art. In each of these different styles he has left works of great excellence. He died at Rome, April 6, 1520.


RAPHAEL SANZIO

Rap'pahan'nock, a river of Virginia, rises in the Blue Ridge of the Alleghany Mountains and flows southeasterly into Chesapeake Bay, its total length being about 250 miles. The chief branch is the Rapidan; and these rivers were the scenes of desperate battles during the Civil War, the most noted being Burnside's repulse at Fredericksburg in the winter of 1862–3.

Raspberry (*răz'bĕr-rў*), species of *Rubus*, the bramble genus and a member of the rose family. Associated in the genus with raspberries are blackberries and dewberries. The original garden raspberries are *R. idæus*, natives of Europe, but now said to be almost out of cultivation in the United States. The parent of the black raspberries of the gardens is *R. occidentalis*, common in this country; while the parent of some of the red raspberries is *R. strigosus*, common in the United States, especially northward. Numerous garden varieties have been cultivated from these and other wild species, chiefly by hybridizing. Some wild raspberries are exceedingly ornamental in cultivation, having large showy flowers, chief among which is *R. odoratus*, with purple flowers one to two inches in diameter.

Rat, a gnawing animal related to the mouse and of similar form, but larger. Like mice, rats are quick, burrowing and nocturnal in habits. The brown rat is about eight or nine inches long without the tail. It has spread over the civilized world, having originally come from western Asia. It appeared in Europe during the eighteenth century and has been transported by ships to other countries. It is commonly called the Norway rat, but the name is ill-advised, because Norway was not its original home. The black rat is smaller, being about six or seven inches long. Its original home is believed to have been Persia. It, likewise, spread around the world by migration and transportation, but it is less fierce than the brown rat, and is driven before the latter. The wood, trade or pack rat is one of the most interesting members of the family. Innumerable stories are told of its pranks. It is distributed generally in our southern and western states, and is also found in Mexico and British Columbia. It builds a mound-like nest of twigs, grass, leaves and bark, and does its work at night. It is a large rat, in color a yellowish-gray, with under parts and feet white, eyes and ears noticeably large, and an expression mild and rabbit-like. The cotton-rat of the south, a small yellowish-brown rat, is very greedy and destructive. The marsh-rat, about the size of the preceding, is a great swimmer which sometimes makes its nest among reeds, and shows close relationship to the muskrat. The kangaroo-rat, a pouched rat, is a beautiful little creature, found in the arid regions of our southwest. It is small. This rat has a tail longer than its body, which is tipped with a brush and used as a rudder; a silky coat of softest brown; pointed head, long whiskers, and outside cheek-pouches. With its exaggerated hind legs, and its habit of hopping about thereon with the forepaws tucked up under the chin, it seems like a miniature kangaroo.

Rat Portage. See Kenora.

Rattlesnake, a venomous American snake, with horny rattles on the tail. The rattles are horny rings made of modified scales, so loosely constructed that they rattle when the tail is vibrated. There are about fifteen species, exclusively American. These snakes have grooved fangs that are erected when they strike. There are several reserve fangs on each side to replace those that may be broken. The common rattlesnake of the eastern United States extends from Maine to Texas. It attains a length of four feet, and, exceptionally, may have as many as twenty-three rings in the rattle. The color is yellowish brown of various shades, with three rows of irregular brown blotches; the tail is black. Rattlesnakes are naturally sluggish, and do not attack unprovoked. Their food consists in rabbits, rats, squirrels and other small animals. The prairie rattlesnake or massasauga is smaller and darker colored. It is common in grassy meadows where not exterminated. Several other kinds are found west of the Mississippi and in South America, some attaining a length of seven feet or more.

See Copperhead and Moccasin.

Rauhes (*row'hēs*) **Haus**, (The Rough House) is an institution founded and managed by Johann Heinrich Wichern at Horn, near Hamburg, in connection with German home-missions. It is partly a refuge for neglected children; partly a boarding school for the moral and intellectual education of the children of the higher classes; and partly a training-school for those who wish to become teachers or officials in such institutions as houses of correction. It was opened in 1831 and has since developed into a comparatively large community. The children live in families of twelve, each being under the superintendency of an artisan, who employs the children in indoor and outdoor labor according to their capabilities. They are taught various handicrafts, and gardening.

Raven (*rā'vn*), a large, crow-like bird of the Old and the New World. The American raven is much larger than the crow. The upper part is a glossy black with green and purple reflections, duller below; the feathers of the throat and breast are fringe-like. It is common in the West and Northwest, where it is often seen soaring high over the evergreens. The bulky nest is built on lofty cliff or evergreen, a well-made structure of sticks with soft lining of sheep's wool and fine grasses. The same nest is used year after year, repairs being made for each new brood. The little ones have considerable white mixed with the black. Ravens are gregarious, and dwell with any birds of their genera. The birds are omnivorous. Their note is harsh except during the breeding-season. They can be taught, however, to imitate sounds.

Raven, The, a poem by Edgar Allan Poe, was first published in *The New York Mirror* on January 29, 1845. It is Poe's most famous work, and has been an object of study almost from the day of its publication. Many stories have been told of the circumstances and manner of its composition. Poe himself has told the story, but few critics have been willing to accept his statement. There are many foreign translations, and with French students especially it is an object of great admiration and study.

See Poe.

Ravenna (*rȧ-vĕn'ȧ*), a city of central Italy, is situated in the midst of a well-watered, fertile and finely wooded plain. Ravenna is an ancient city, rich in monuments of art. It affords an example of the fifth Christian century surviving to the twentieth. Besides a library of nearly 100,000 volumes, it has an archæological museum, and educational institutions. The city probably was of Umbrian origin; at least it was an Umbrian city when it passed into the hands of the Romans. Augustus made it a firstclass seaport and naval station, and 400 years later Emperor Honorius took refuge there and made it the capital of the Roman empire. It attained its greatest glory under Theodoric the Ostrogoth, whose mausoleum is outside the walls. It contains the tomb of Galla Placidia, a Roman princess, who lived from 388 to 450 A. D., and was the daughter of Theodosius the Great. Dante died there in 1321, and his ashes remain there still. It became a republic in the early part of the 13th century, but was subject to Venice from 1440 to 1509. Then it passed into the hands of the popes and continued under their domination until 1860. Byron resided at Ravenna from June, 1819, to October, 1821. Population 64,031.

Raw'lins, John A., American soldier, was born at Galena, Ill., Feb. 13, 1831, where he was admitted to the bar and commenced the practice of law in 1855. He was appointed adjutant-general on the staff of General Grant in 1861, and with scarcely any interruption he was with Grant in all his battles. marches and campaigns, rising from captain to major-general. He died on Sept. 9, 1869.

Raw'linson, George, was born at Chadlington, Oxfordshire, in 1815, and after graduating at Oxford was elected a fellow and tutor in Exeter College. In 1860 he published his notable Bampton lectures on the *Historic Evidence for the Truth of the Christian Records.* His historical works cover nearly the entire history of the ancient orient, commencing with an edition of Herodotus, in which many of his brother's discoveries are incorporated. This was followed by *The Five Great Monarchies of the Ancient Eastern World, The Sixth Great Oriental Monarchy, The Seventh . . . Monarchy, A Manual of Ancient History* and *A History of Ancient Egypt.* He died in 1902.

Rawlinson, Sir **Henry,** K. C. B., oriental scholar and diplomat, was born at Chadlington, Oxfordshire, England, April 11, 1810. He entered the Indian military service in 1827, and served in Bombay presidency until 1833, when he was appointed to assist in reorganizing the army of the Shah of Persia. During the six years he spent in that country he began to study the cuneiform or wedge-shaped inscriptions, and made a translation of the famous Behistun inscription of Darius, which he published in the *Journal of the Asiatic Society.* He held command of Kandahar during 1840–42, and in 1844 was appointed political agent at Bagdad and consul-general in 1851. In 1858 he was sent to Persia as British minister. In 1871 he became president of the Royal Geographical Society. He died at London, March 5, 1895. He wrote *England and Russia in the East, The Cuneiform Inscriptions of Western Asia, Outline History of Assyria* etc. See CUNEIFORM.

Ray'leigh (*rā'lĭ*), **John William Strutt,** BARON, one of the most eminent of English physicists, was born on Nov. 12, 1842. He was educated at Trinity College, Cambridge, where he graduated as senior wrangler and Smith prizeman in 1865. In 1879 he succeeded Clerk-Maxwell as professor of experimental physics at the University of Cambridge, but resigned in 1884. Later he succeeded Tyndall as professor of physics at the Royal Institution in London. His profound scholarship is well illustrated by his *Theory of Sound,* which has remained a standard ever since its publication in 1877–8 His prodigious activity is illustrated by his *Scientific Papers,* published in 1901.

Ra'zor=Shell, a long bivalve-shell, shaped like a razor-case and belonging to the razor-clam. The shell gaps at each end, and from one the siphons or water-tubes of the animal protrude. This animal makes vertical burrows in the sand, two or three feet deep, and ascends and descends by means of its foot. Razor-shells are used both for food and bait.

Read, Opie, American novelist and journalist, was born at Nashville, Tenn., Dec. 22, 1852, and educated at Gallatin, Tenn. He began newspaper work at Franklin, Ky., but proceeding west made Little Rock, Ark., his home for about ten years, where he founded and edited a humorous weekly, *The Arkansaw Traveler.* He subsequently removed to Chicago, where he has published successful stories dealing with southern life. His more important novels include *A Kentucky Colonel, A Tennessee Judge, An Arkansaw Planter* and *On the Suwanee River.*

Read, Thomas Buchanan, American poet and painter, was born in Chester County, Pa., March 12, 1822, and after spending a year or two in the studio of a sculptor in Cincinnati, O., he gave his attention to painting, entering on the practice of that art in Boston at 20. In 1850 he went to Florence, Italy, where he continued to live, visiting America occasionally until his death, at New York, May 11, 1872. He won considerable fame as a portrait-painter, and took an active interest in the cause of his native land during the great Civil War, his most popular poem, *Sheridan's Ride,* being written during that conflict, which he afterwards illustrated. His *Wagoner of the Alleghanies* was written in 1862, and read publicly throughout the country by James E. Murdock for the benefit of the sanitary commission.

Reade, Charles, a distinguished English novelist, was born at Ipsden House, Oxfordshire, June 8, 1814. He received his education at Oxford, where he so distinguished himself as to secure a fellowship in 1835. It was not until 1850, however, that he commenced his career as a writer. "I," he himself tells us, "studied the great art of fiction for 15 years before I presumed to write a line of it, writing first for the stage — about 13 dramas, which nobody would play." Apart from his numerous quarrels and lawsuits, his life after 1852 is a record of the production of plays and novels. By the former he generally lost money, and by the latter secured both money and fame; for, in spite of all his peculiarities and defects, he showed himself a story-teller of rare gifts and powers. Among his novels are *Hard Cash*, *Never Too Late to Mend*, *Put Yourself in His Place* and *The Cloister and the Hearth*. He died at Shepherd's Bush, London, April 11, 1884, his last years clouded by sorrow and ill-health. See *Memoir* by Compton Reade.

READING: PRE-SCHOOL AGE

How Mothers May Teach Their Children at Home

by

Mrs. Winifred Sackville Stoner

Founder and Director of the International Natural Education Association

Of the so-called Three R's, reading is the most important in giving the child an educational foundation. A mother cannot begin too early in providing her child with the *open sesame* to knowledge. The best knowledge of all ages is in books, and when young children are taught to read, and good books are placed in their environment, they read not only for amusement but for information.

I believe in equipping children early in life with tools that help them gain knowledge, and that is why I taught my daughter, Winifred Sackville Stoner, Jr., how to read when she was but seventeen months of age.

There are educators who will warn parents against injuring children's eyes through early acquisition of the reading art; on the other hand, muscles are improved by exercise as long as they are not strained. There can be no strain through the Natural Education Method of learning to read via the typewriter and books printed in large type. At the same time the child learns to play to a purpose and gains co-ordination of mind and muscle.

Teaching Reading Through Environment. As environment is the architect of children's lives, make your nursery walls into teachers. Cut large capital letters out of red cardboard and make a frieze for the nursery wall. Use red because young children prefer this color to any other.

When buying balloons, select those that are lettered. Use a lettered ball, table, and plate for the child's food. Equip the nursery with a box of anagrams, a box containing both rough and smooth letters, a box of colored sticks (curved and straight), plasticine out of which to form letters, a train of cars made out of small powder boxes each marked with a special letter from A to Z, crayons to draw letters, and place a Chautauqua industrial art desk upon a low table. On the desk place a portable typewriter with a standard keyboard and single shift. These tools are helpful in teaching little folks to read.

Do not try to teach your child the entire alphabet at one time, but interest him in the sounds of the letters by singing to the air of "Twinkle, Twinkle, Little Star":

ABCDEFG (form *G* with hands)
H I J K L M N O P (form *P*)
Q R S T U V (form *V*)
W X Y Z—I'm as happy as can be
Because I know my A-B-C

I am opposed to singing Mother Goose jingles because these nonsensical rhymes teach nothing worth while and often give wrong impressions of morals, table manners, and the English language. If you will sing jingles like the above, the children will gain knowledge while they are singing. The mother should point to the letters as she sings.

Some teachers believe that children should be taught words as a whole rather than to learn the letters first and then build words. Children who do not know the letters forming words are rarely good spellers. The child who learns to build words learns also to spell.

In teaching one letter at a time begin with A. Show Tommy letter *A* on the wall, on his blocks, ball, table, plate, desk, etc. Then give him a box of anagrams and ask him to load the *A* box car of his train with letter *A's*. Help him find *A's* and then see if he can do it without aid. On the following day ask him to bring to you block *A* and you will then discover whether your training has placed *A* in the sub-conscious reservoir of knowledge that will remain with him through life. Then draw a letter *A* on white paper with a red crayon, make *A* with sticks, and form it out of plasticine, encouraging Tommy to do likewise.

In the same way teach him how to recognize the other letters. But long before you have reached *Z* you can show him how to put letters together in the *AT*, *ET*, *IT*, *OT*, *UT*, etc., families. He can learn how to spell *C-A-T cat*, using a picture of a cat and his blocks and anagrams. Afterwards he can learn to spell all of the words in the *AT* family—*bat*, *cat*, *fat*, *gat*, *hat*, *mat*, *nat*, *pat*, *rat*, *sat*, *tat*, *vat*.

After learning words in different word families the child will enjoy looking for these word friends in books, street cars, etc., and thus he will gain the reading art. A jingle like "The House That Jack Built" is helpful in teaching reading because the words are repeated, but the subject matter is not educational. Mothers can make simple reading lessons concerning objects in the modern home, writing the lessons on the typewriter.

Let us take BREAD for our reading subject:

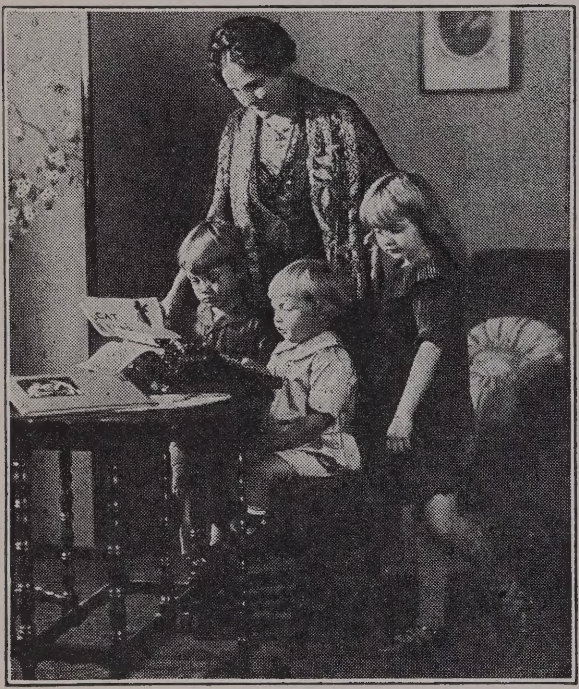
Here is the bread that Ann baked
Here is the flour used in the bread that Ann baked
Here is the wheat that made the flour—
Here is the lad who sowed the wheat—

Piano Used in Learning Words. Paste tiny red letters *c-d-e-f-g-a-b-c* on the keys of the piano beginning with middle C. Play games with the child in seeing how many words can be spelled upon the piano, beginning with small words like *bee, bag,* etc.

Sing and spell as you use words that rhyme, such as *boy, toy, joy.*

Making Words With Fairy E. Give the child a number of *E's* and see how many new words he can form by adding *E* to words as *cap, tap,* etc. Put letters in front of certain combinations. *A-B* (ab) with *T* spells *tab. A-D* (ad) with *B* spells *bad,* etc.

Building Word Houses. This game delights all children. Print names of familiar words on brick-shaped cardboards and put into a box. Tommy draws one. If he recognizes *R-A-T* as *rat* he keeps the brick to build his house. If not, mother keeps the brick.



"MOTHER" STONER TEACHING CHILDREN

First Reading via Typewriter. Arouse the child's interest in the typewriter by showing him the picture of some familiar subject—let us say—a cat. Beneath the picture of the cat, print the letters *C-A-T.* Point to the *C* on the wall, an anagram *C,* and other *C's* in the room. When you are sure that Tommy knows the letter *C,* let him sit in front of the typewriter and ask him to find *C* among the shining keys. When he finds *C* he will be very happy and now he is ready to make *C's.* Sing to air of "Twinkle, Twinkle, Little Star" and holding the first finger of his right hand in your own right hand, strike *CCCCCCCC-CCCCCC.* Show Tommy the row of C's and he will want to make more without your assistance. Fifteen minutes, however, is as long as any child should concentrate upon one thing. Never force Tommy to practice upon the typewriter.

Second Reading Lesson Via Typewriter. Show Tommy the letters *A* and *T* forming *CAT* and teach him to write these letters as he wrote *C.* When he knows the three letters, hum the air of "Oh, Happy Day" as he writes *C-A-T cat* (repeating four times and striking the space bar when saying *"cat"*. The whole *AT* family can be sung to this air.

Other Lessons. After Tommy shows interest in finding letters on the machine and in matching words in books with words that he writes, give him four lettered words and use the air of "Farmer in the Dell" as he sings *"G-O-O-D, good, G-O-O-D, good,* we are always happy when we're *G-O-O-D good* (strike space bar for all words but *G-O-O-D*). Then use words that rhyme with *good.* Any march time air can be used for words of four letters.

Play to a purpose via typewriter creates such an interest in children that they teach themselves to read through copying rhymes and stories. They gain power of concentration and observation and even learn how to know punctuation marks. After showing the child how to find letters and spell words, a mother needs only read a few lines from a book to her child, pointing out the various words, and he will then impress these words upon his mind by copying them upon the typewriter. In this way an indelible impression is made upon the child's mind not only of words but of the letters that form the words; thus reading and spelling become one art.

The mother who teaches her child to read in the pre-school age not only trains the child to be busy to a good purpose, giving him an opportunity to get ahead in his school work, but also saves much time for herself. The child who has been initiated into the reading art has at all times some means of amusing himself. He is not lonely if he has no playmates because he finds friends in books. He is keenly interested in sign boards and other reading matter, which he sees when he takes walks. He has a tool that keeps him busy and happy.

Reading (*red'ing*), **Pa.,** a city, county-seat of Berks County, on the left bank of the Schuylkill, 60 miles from Philadelphia. It is pleasantly situated on an ascending plain, and draws its water-supply from the neighboring hills. The principal manufactures are iron and steel works, which include many rolling mills, forges, foundries, furnaces, etc., but its railroads and machine shops, potteries, hosiery and knitting mills, hat-factories, paper and woodpulp mills are important. Among the educational institutions, beside public schools, are Reading Classical School, Reading Academy and Business College, Schuylkill Seminary and Mount Saint Michel's Academy. Reading has an admirable system of parks, fine churches and the service of the Pennsylvania and Reading railroads. Many of the inhabitants are of German descent, and half the newspapers are published in that language. Population 120,000.

Reap'ing-Machines have developed far from the original reaping-hook or sickle, which was used among the ancient Jews, Egyptians and Chinese. Roman Pliny in 23 A. D. spoke of a reaping-machine used by the Gauls, which in fact was a cart with projecting teeth, in which the ears were caught, and then plucked by hand. This cart was pushed from behind by an ox. But Ogle's machine, invented in 1822, was the first reaping-machine which at all resembled the modern type. Another fairly successful attempt was Bell's machine of 1827. These machines were English. American reaping-machines date from 1803; and have developed much more efficiently than the English types. (See McCormick, Cyrus). By 1850 very efficient reaping-machines had been constructed. They possessed a cutter with either straight or serrated edge, working over a platform upon which the grain might fall; and they were drawn from the side by horses. The combination of binding with reaping began after 1850. Some reaping-machines are now adapted so that they thresh the grain and feed it into bags at the same time that they are cutting off the heads. Such machines have had much to do with the success of large farmers, who can compete by means of their machinery to advantage with the smaller landholders. Lawnmowers are a kind of side development from the agricultural reaping-machines. Even vegetables, such as peas, are now often harvested by machinery. The ordinary reaper and binder for wheat cuts the grain, ties it in neat sheaves, and throws off these sheaves in bundles of eight or ten, ready for carting to the barn.

The industrial and economic effects of the reaper can not be overstated. It has been said that in the American Civil War it did the work of 1,000,000 men in the northern states, releasing 350,000 men for military service. Stanton in 1861 stated that to the north it was what the slave was to the south. Seward averred that "the reaper pushed the American frontier westward 30 miles a year." President Hughitt of the Chicago and Northwestern Railway declares that "the reaper has not yet received proper recognition for its development of the west." Yet even its work in the United States is not all. It is used in 50 other countries, as Algeria, Argentina, Australia, Canada, Cape Colony, China, India, Russia and Siberia, and "its click has become the music of an international anthem." A single Russian province uses 37,000 American harvesters. The American reapers in use in Europe in 1907 did the work of 11,000,000 men. The reaping of wheat costs less than a cent a bushel. Next to Russia, among foreign countries, in the use of the reaper comes Canada, Argentina ranking third.

The industry has attained enormous proportions. One company makes over 700,000 harvesting machines of all varieties each year. In 1911 it sold $108,000,000 worth. In 1909 American farm machines worth $146,326,000 were made. The harvester has to be adapted to the particular conditions of farming in different countries and to the peculiar customs of their farmers. Harvesters must be adapted to big horses in France, camels in Siberia, oxen in India and small horses in Russia; to the careful German of Wisconsin and to the rough ranchers of Argentina.

Reciprocity (*rĕs'ĭ-prŏs'ĭ-tȳ*), an arrangement between two countries charging tariff-duties against other countries, to admit such articles as may be agreed upon into each other's ports free from duty. When the McKinley tariff-law of the United States was passed in 1890, a provision giving the president discretionary power to enter into reciprocity treaties or arrangements with other nations was made one of its leading features.

Rec'lama'tion of Swamp-Lands. The available agricultural lands of the United States are, for the most part, occupied. With a rapidly growing population and increasing demand for agricultural products, the need of additional farm-land has forced itself on the attention of the public and of the national government. This has resulted in the vast undertakings of the government in the reclamation of arid lands by irrigation. (See Irrigation). More recently the reclamation of swamp-lands has claimed attention.

The area which has been brought under cultivation by irrigation approximates 8,000,000 acres, and it is thought probable that 12,000,000 acres additional may be reclaimed within the next 25 years.

In 1902 the United States Reclamation Service was established by Congress. As a result of their efforts the waste lands which have already been made productive yield over $60,000,000 annually.

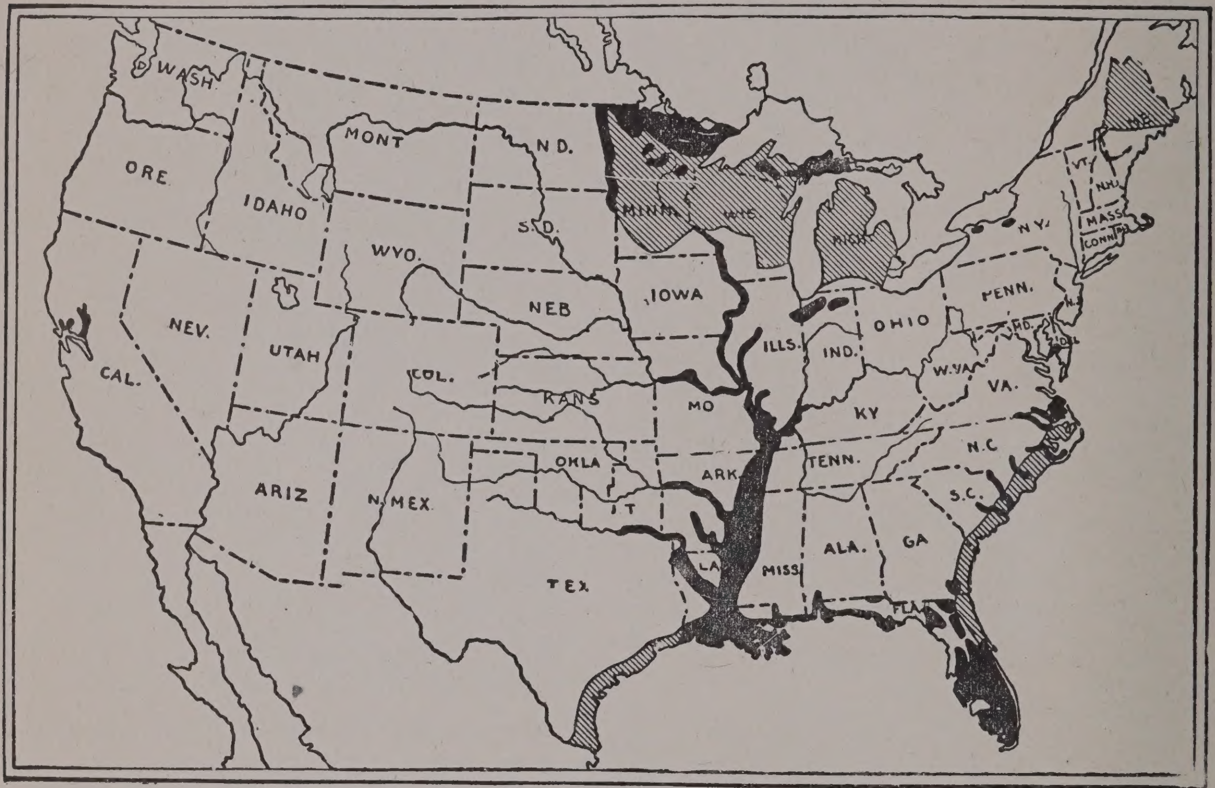
The drainage of the Everglades in southern Florida has been progressing lately. To make usable thousands of square miles of this swamp land, Lake Okechobee would need to be lowered only about twenty feet. At present, ten main canals lead out from the lake, and five million acres are being drained.

In western United States reclamation of lands is largely a matter of supplying water to very dry areas. This is accomplished by damming large rivers, thus saving the water supply for the dry season. Three of the greater dams in the West are the Roosevelt in Arizona, the Elephant Butte in New Mexico, and the Arrowrock in Idaho.

Investigation shows that there are over

60,000,000 acres of swamp and overflowed lands in the United States. It is estimated that already as large an area of lands of this character has been reclaimed by drainage mostly by the effort of individuals, drainage-associations and states' action, as that secured by irrigation, and that the reclamation of a much larger area is practicable if the work be undertaken by the Federal government. It is well-known that swamp-lands which have been successfully reclaimed have become the richest of agricultural lands. If it were possible to reclaim by drainage 25,000,000 acres of these swamps, the land-values of the country would be increased by more than $2,500,000,000. If subdivided into 40-acre farms, these swamps would supply 1,250,000 families with homes.

Many drainage works of minor importance have been undertaken by individuals, corporations, districts and states, and the work of the government thus far has been chiefly in aid of such enterprises. In Louisiana much important work has been done in the neighborhood of New Orleans; in Florida near the Everglades; in Minnesota and North Dakota in the upper valley of Red River, in Indiana in the Kankakee Marshes; and in California in the lower Sacramento Valley. The people of Illinois, of lower Minnesota and of other portions of the country have built ditches and drained considerable areas of lands which now are under cultivation. The complications, however, resulting from any attempts on the part of private parties or of counties or states, arising from conflicting rights and benefits, together with the enormous expense which must be incurred, have prevented the undertaking of large projects. This work can be done only by the Federal government, and the subject has secured the attention and the consideration of Congress, a Federal Drainage Bill having been favorably reported. A large amount of preliminary work has already been accomplished in the preparation of topographic maps which give a vast amount of important information concerning slopes and drainage of the surface of the land, and show where the swamps occur, their relation both in distance and position to natural drainage-channels and also the altitude of the swamps as referred to the drainage channels. The Secretary of Agriculture in his last report says: "Attention has been given to the possibilities of drainage in the delta-region of the lower Mississippi Valley. The completeness of the levee system is now rendering safe the expenditure of large sums for the improvement of the low, flat lands formerly subject to overflow by the Mississippi floods. The problem of the reclamation of swamp tide-lands along the Atlantic coast has received special attention during the last year. The Everglades of Florida, Dismal Swamp in Virginia, the Kankakee



SWAMP-AREAS IN UNITED STATES

The black indicates swamp-areas. The ruled portion indicates areas interspersed with swamps

Valley in Indiana and the Red River Valley in North Dakota have each been subject of survey and study."

The map here given shows the principal areas of swamp-lands in the United States.

Réclus (*rā-klü'*), **Jean Jacques Élisée.** In 1830, a whole decade before Humboldt published *Cosmos*, his successor in the science of geography was born in a Protestant parsonage in the village of Ste. Foy-la-Grande, near Bordeaux, France. Having no money to gratify his taste for travel, Réclus was forced to find wonders at home. So he questioned his native bogs, moors and streams as to their world-old adventures and dug for the answers. He had two years at school in Berlin, which he spent in studying the natural sciences and in learning how to test physical phenomena. Returning home, he got into politics and into trouble and, fortunately for the world, was sent into exile by Napoleon III. Falling in with California goldseekers, he crossed our unexplored region of plains and mountains, and went back to publish a classical description of it that made him famous in science and literature and decided his life-work. He was past 40, and again in exile for meddling in politics, when he wrote *La Terre* (The Earth). This was followed by *The Ocean*. Monumental works in themselves, these volumes became merely introductory to his *Géographie Universelle* (21 volumes, 21,000 pages) that has been translated into every modern language. It was his life-work, occupying him from the age of 40 to 66. The work differs from most scientific treatises. To the profoundest knowledge and exactness Réclus brought the imagination of a poet, the literary style of a Ruskin. Many. indeed, most of the laws governing natural phenomena, were determined before Réclus, but he brought them all together and unified all. He summed them all up in this image of the earth on which we live: "A grain of dust in the fathomless abyss of creation, ever actuated by ceaseless motion, describing in ether a series of elliptical spirals, whirling with the velocity of a cannon-ball, shooting forward with the swiftness of light and rocking back and forth in its headlong flight—as if to salute the stars in passing."

Absolutely scientific in its last analysis, only a poet could so transform dry facts. This great work, so plain, as easy to understand as a book of travels, as fascinating as a collection of romances, should be among the first to be purchased by any library, however small. Réclus died at Brussels on July 4, 1905. No biography of him has, as yet, appeared in translation.

Re'construc'tion in the South. The period known in the United States as Reconstruction followed hard after the Civil War, when it was necessary for the southern states to resume their place in the Union; and in seeking a solution of this problem the president and Congress soon were widely at variance. President Johnson adopted the theory that these states had never lost their position in the Union; and that, upon a renewal of their obligations to the Federal constitution and the laws of Congress, they were entitled to immediate restoration to their former relations as members of the Union. He accordingly proceeded to establish provisional governments in the seceded states, and by proclamation set forth the terms upon which these states would be recognized by him as members of the Union. One of these requirements was the ratification by each state of the thirteenth amendment to the Federal constitution, which had been adopted by Congress in February of 1865 and abolished slavery throughout the Union. The people of the seceded states proceeded to comply with the president's requirements. They held conventions, ratified the thirteenth amendment, framed new constitutions, and elected senators and representatives to Congress. But Congress, when it assembled in December, repudiated the restoration policy of the president. It was held by a large majority that the work of reconstruction properly belonged, not to the president, but to Congress; that the seceded states had lost their rights as members of the Union; and that they should be re-admitted only on such conditions as would secure and perpetuate the results of the war. Meanwhile the thirteenth amendment to the constitution had been ratified by the requisite number of states, and had been officially declared to be a part of the constitution of the United States. Congress now proceeded to confer citizenship upon the freedmen of the south. The Civil Rights Bill was passed over the veto of the president. The fourteenth amendment to the constitution, which included this and some other provisions, was also adopted and submitted to the states for ratification It was ratified by Tennessee in 1866, and that state was re-admitted by Congress into the Union. The other southern states rejected the amendment. At length, in March, 1867, the reconstruction act of Congress was passed over the veto of the president. This act defined the conditions on which the southern states might be re-admitted, one of which was the ratification of the fourteenth amendment, and placed these states under military governors until these conditions should be complied with. In June and July of 1868 Arkansas, Alabama, Georgia, Florida, Louisiana, North Carolina and South Carolina, having ratified the amendment and organized state governments under the provisions of the reconstruction act, were admitted into the Union.

The fourteenth amendment, having been ratified by the requisite number of states, was officially declared a part of the constitution on July 28, 1868 The fifteenth amendment to the constitution of the United States was adopted by Congress in February of 1869, and was submitted to the states for ratification. It provided that "the right of the citizens of the United States to vote shall not be abridged by the United States or any state on account of race, color or previous condition of servitude." Virginia, Mississippi, Texas, and Georgia, which had delayed action required, were re-admitted in 1870.

During all this period affairs in the south were far from peaceful. The slaves of yesterday were now citizens and voters. In their utter ignorance they often became the tools of corrupt and designing men. Many of these, known as carpet-baggers, came from the north and took advantage of the situation to further their own selfish interests. To the whites of the south conditions were intolerable; resistance was inevitable and often took the form of acts of violence. The state authorities could maintain themselves only by invoking the aid of the general government. But the interference of the Federal government in state affairs has ever been viewed with distrust. At length a better feeling prevailed. The leaders of the south asserted that if left alone they would carry out in good faith the provisions of the constitution and laws of Congress. The disabilities of the ex-Confederates were removed by Congress in 1872, and finally President Hayes in 1877 withdrew the Federal troops from the southern capitals and announced the policy of Federal noninterference in state affairs. This may be regarded as the close of the reconstruction period. See CARPET-BAGGERS.

Red'breast, a bird belonging to the family of the Old World warblers. It is well-known in the British Isles, and is called robin-redbreast; but, it should be noted, this is not the American robin, which is a thrush. It is about 5¾ inches long, olive brown above, with the throat and upper breast a reddish orange. The abdomen is dull white. It occurs solitary or in pairs, and rears two or three broods a season near the ground, building a nest of dry leaves, moss, grass, hair and feathers. The eggs, usually five in number, are grayish-white speckled with rusty red. The English robin-redbreast is quite a sociable bird; it dwells close to the haunts of man and is fond of household dainties. Its song is sweet and plaintive.

Red-Cross Societies, a federation of relief societies in the different countries acting under the Geneva convention. The original aim of the societies was to ameliorate the condition of the sick and wounded in time of war. They had their origin in an agitation begun by Jean Dunant, a philanthropic citizen of Geneva, who in 1862 published an account of the suffering he had seen on the battle-field of Solferino, June 24th, 1859. He attributed much of the suffering to the lack of provision for the proper care of the sick and wounded and suggested that societies be formed in the different countries to collect supplies and train nurses etc., in times of peace to co-operate with and assist the regular surgical corps in time of war. The Society of Public Utility in Geneva took up the suggestion. In the following year an international conference was held in Geneva, at which sixteen nations were represented. A provisional program was agreed upon and in August, 1864, a more formal, diplomatic congress of representatives from the same nations was held, at which was signed what is now known as the Geneva convention. A red cross upon a white field was adopted by the congress as the exclusive badge of all societies formed in accordance with the principles of the convention. The first international conference of Red Cross societies was held in Paris in 1867. Red Cross societies were first formed in the United States in 1881, and the Geneva Convention was first ratified by the United States government in 1882. Miss Clara Barton, President of the Red Cross societies in the United States suggested that they be prepared to render relief to the suffering in times of great calamities, as fires, floods, famine, pestilence etc. as well as in times of war, and her suggestion received the unanimous sanction of the National and International Committees. The Hague peace-conference in 1899 ratified the proposal of 1867 that the provisions of the societies be extended to naval warfare. While international conferences of the Red Cross societies have been held and the Society at Geneva serves as a Central Committee by which an international bulletin is published and through which all international communications are made, the societies are not really international. They are national and independent, each governing itself and making its own laws according to the genius of its nationality and needs. All societies throughout the world have a common badge and a common aim, and sustain mutual relations to the convention. The American society has furnished relief amounting to several millions of dollars besides inestimable personal service. The society, in its own vaults, always accessible, night and day, keeps funds sufficient for any sudden emergency.

Red Jack'et, a chief of the Seneca Indians was born near Seneca Lake, N. Y. in 1752, his original name being Sagoyewatha and the name of Red Jacket being given to him on account of a scarlet jacket presented to him by a British officer during the Revolutionary War. He was an active ally of the

British in that contest; but in the War of 1812 he rendered valuable service to the United States in the operations on the Canadian frontier. During his last years he lost much of his prestige and influence by his intemperate habits. He died on Seneca Reservation, near Buffalo, in 1830.

Red'lands, Cal., a city sixty miles from Los Angeles, in San Bernardino County. It is at the base of San Bernardino Mountains in a famously beautiful and fertile region. Fire clay exists in this section, and the oranges are especially fine. Other fruits, barley and wheat are grown, and the important trade consists chiefly of raisins, oranges, lumber, building-stone and fire-clay products. Redlands has an admirable school-system, a library, all modern improvements and the service of two railroads. Population 10,449.

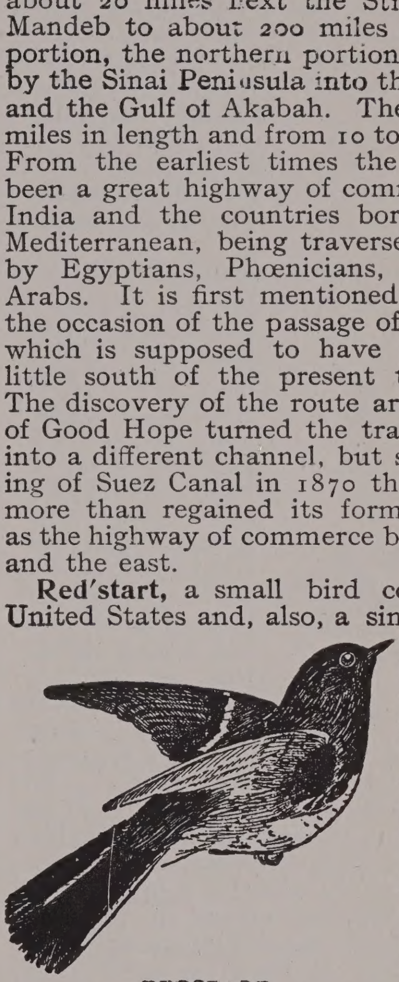
Red Riv'er, the lowest western branch of the Mississippi, rises in the northern part of Texas, near the New Mexico border, and flows eastward as the boundary line between Texas and Oklahoma, thence southeast through Arkansas and Louisiana, entering the Mississippi a little over 300 miles from its mouth. It receives its name from the color of the sediment with which it is loaded during high water. Its total length, on account of its winding course, is 1,500 miles; and it receives numerous branches, the Washita, the Negro and the Little Wichita being the most important. It is navigable during seven or eight months of the year to Shreveport, La., 300 miles from its mouth.

Red River of the North rises in a cluster of lakes in western Minnesota and flows northward, separating Minnesota from North Dakota, into Manitoba, and emptying into Lake Winnipeg, about 600 miles from its source.

Red River Rebell'ion. Upon the extinguishment of the claims of the Hudson Bay company and the taking over of the Northwest Territories in 1870, the 12,000 inhabitants of the Red River settlement found themselves ignored. Of the several factions, the whites, 2 000 strong, and the half-breeds of Scotch and Indian origin, found themselves overruled by the *Metis* or French half-breeds, with the assistance of the Fenians who had already made trouble and a number of American immigrants bent on annexation. Louis Riel, upon the coming of William McDougall, the lieutenant-governor, seized Fort Garry in October 1869, and had McDougall turned back at the frontier. Forming a provisional government, Riel had a young man shot for treason against his rule, and this murder set the country aflame. Of the thousands volunteering for suppression of the revolt, 700 were accepted, and these, with 500 regulars, the whole under the command of Colonel Garnet Wolseley, formed the Red River Expeditionary Force. Before they could reach Fort Garry in August, 1870, after toiling through the wilderness, Archbishop Taché, acting as pacificator, succeeded in inducing the rebels to lay down their arms, and the little army found no opposition, the leaders having fled across the border. (See RIEL, LOUIS.

Red Sea or **Arabian Gulf** is an inlet of the Indian Ocean, stretching northwest from the Strait of Bab-el-Mandeb (by which it communicates with the Gulf of Aden) to the Isthmus of Suez, by which it is separated from the Mediterranean. Its length is from about 20 miles next the Strait of Bab-el-Mandeb to about 200 miles in the central portion, the northern portion being divided by the Sinai Peninsula into the Gulf of Suez and the Gulf of Akabah. The former is 180 miles in length and from 10 to 15 in breadth. From the earliest times the Red Sea has been a great highway of commerce between India and the countries bordering on the Mediterranean, being traversed successively by Egyptians, Phœnicians, Hebrews and Arabs. It is first mentioned in *Exodus* on the occasion of the passage of the Israelites, which is supposed to have taken place a little south of the present town of Suez. The discovery of the route around the Cape of Good Hope turned the traffic with India into a different channel, but since the opening of Suez Canal in 1870 the Red Sea has more than regained its former importance as the highway of commerce between Europe and the east.

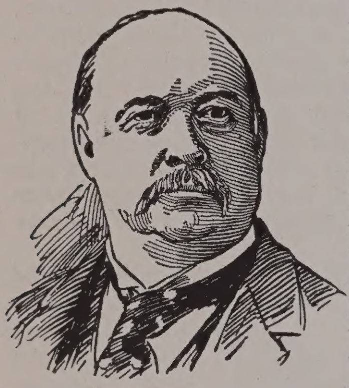
Red'start, a small bird common in the United States and, also, a similar bird common in Europe, but belonging to a different family. The European redstart belongs to the family of Old-World warblers. It is slightly smaller than the American bird, being about five and one quarter inches long. It is dark-gray, with black throat, white forehead and rusty-red breast, sides and tail. In some parts of England it is called the fire-tail. The American redstart belongs to the family of New-World warblers. It is about five and one half inches long, its general plumage a glossy black with salmon or orange-red on wings and tail, breast and lower part white. This bird is seldom seen on the ground; it perches on trees from which it is continually flitting to catch insects on the wing, and gleams in and out among the greenery like a bit of fire. It migrates early in May and in September, is found as far west as the Pacific coast and north to upper Canada. Its note is sweet



REDSTART

and oft-repeated. Its nest is a trim, cup-shaped affair of thin strips of bark, fine grass, vegetable fiber and plant-down. The three to five whitish eggs are blotched with brown and lilac.

Reed, in music, the mouthpiece of a hautboy, bassoon or clarionet. It also is a piece of metal with a brass spring or tongue so attached to it that the admission of a current of wind causes it to vibrate and produce a musical note. The reed is of two kinds: the *beating* reed and the *free* reed. The former is used in the pipes of an organ, and must be placed within a tube to produce a musical sound. The invention of the free reed has been ascribed to Grenié, a Frenchman, who brought it into use, but it had long been known to the Chinese. Its note is smoother and mellower than that of the beating reed, and it has the advantage of not requiring a pipe, which is a necessary appendage to the latter.



THOMAS B. REED

Reed, Thomas B., American politician, was born at Portland, Me., Oct. 18, 1839, and graduated from Bowdoin College in 1860. After serving a short time as assistant paymaster in the navy, he studied law and commenced legal practice in 1865. After serving successively as a member of the Maine legislature, as attorney-general of the state and as city solicitor of Portland, he was elected a representative in the 45th Congress in 1876. His commanding ability was so clearly recognized that he soon became the acknowledged leader of the Republican party on the floor; and, when his party secured a majority of the house of representatives in the 51st Congress, Mr. Reed was chosen speaker. He served continually in Congress until 1899, and was elected speaker of the 54th and 55th Congresses. He was re-elected in 1899, but resigned his seat and took up the practice of law in New York City. He published *Reed's Rules* in 1894, and edited *Modern Eloquence.* He died on Dec. 7, 1902.

Reeves, John Sims, one of England's greatest singers, was born at Shooter's Hill, Kent, Oct. 21, 1822. At fourteen he was deemed a skillful performer on various instruments, and was appointed organist and director of the choir. He went to Paris in 1843 to perfect his voice and style, and on his return to England in 1847 he was recognized as its first tenor, a position which he maintained for years, his voice being one of wide range and of great natural sweetness and purity. He died at Worthing, Sussex, Oct. 25, 1900.

Refin'ing.

Kerosene-Refining. Crude petroleum, commonly called oil, is refined into purer oils for lubrication and illumination. The method of refining is a process essentially of gradual distillation. The crude oil is conducted into iron vessels fitted with a dome from which a vapor-pipe leads to a condenser. The oil is then gradually heated until one constituent after another is given off as vapor. The principle of refining is that each oil has its own volatile temperature, so that one kind of oil may be conducted by the vapor-tube to its own tank and then condensed and collected and shut off, before another kind begins to evaporate. Naturally this simple method of distillation, where there are so many substances present as in petroleum, does not yield perfectly pure products. The first gases to be given off from the petroleum are various forms of naphtha. A second still is generally used for the distillation of benzine and the heavier oils, which are chiefly used for illumination and lubrication. The naphtha constituents of petroleum pass off in the following order: cymogene, rhigolene, petroleum, ether, gasoline and benzine. The residuum is then filtered, and a further separation of oils is effected by the filtration, as the lighter oils come through the bone-black or fullers' earth more rapidly than do the heavier. Most of the lubricating oils are obtained in this process. The oils are tested with regard to color and specific gravity. It is important, however, that such oils as kerosene, which are in wide demand for illumination, should not be too inflammable; and therefore they are tested that their flashing-point may not be lower than 110° F. nor their burning-point lower than 125° F. Machine-oils are tested for coldness, as they must not thicken too readily.

Sugar-Refining. The refining of sugar is largely by filtration and evaporation. The raw sugars made from beet, cane etc. differ greatly in their constituents, the beet containing alkalines and the cane ethers and oils The refining process makes the sugars practically identical, except in the lower grades. The raw sugar is dissolved in a thirty per cent. solution, filtered through bags, often treated with lime, and then filtered as in the case of petroleum over bone-black. By this process the sugar is bleached. The almost white solution that results is then boiled and the size and hardness of the crystals may be regulated by the higher or lower vacuum, the lower vacuum producing the harder crystals. The crystals are dried in centrifugal dryers. The first granulation gives the highest grade of sugar; lower granulations give lower grades.

Ref'orma'tion, the great religious revolution of the 16th century. With the Reformation began what is known as *Modern Europe*, while the epoch that preceded it bears the equally distinctive name of *Middle Ages*. From 800, when Charlemagne was crowned emperor of the Romans by Pope Leo III, western Europe had been under complete subjection to the church, and many abuses has arisen. The revival of learning and the discovery of the New World had also awakened a spirit of independence in men's minds. It only required a spark to kindle the slumbering agitation into a definite flame. This was supplied by the sale of indulgences under Pope Leo X. Once started, the Reformation made such rapid progress that the national churches of Britain, Sweden, Norway, Holland and many parts of Germany and Switzerland separated from Rome, while in other countries, as Hungary and France, the same movement detached large portions of the people from the Roman faith, without separating the church itself from the papacy. By the middle of the 16th century it seemed as if the revolution would carry everything before it. At the beginning of the Reformation the authorities of the Roman church did not realize the extent of the danger which threatened it, regarding the movement merely one of the many discussions and schisms to which the church had always been more or less subject; but when they saw the revolt spreading into country after country and taking so firm a hold on the minds both of rulers and people, their eyes were opened and they proceeded to the repair of the breaches that had been made with all the zeal and energy of which they were capable. The Society of Jesus, founded by Ignatius Loyola in 1540, supplied an army of enthusiasts whose policy and devotion saved Rome from dissolution. By the decrees of the Council of Trent (1547–63) the church reaffirmed its ancient doctrines and traditions; and a succession of popes during the latter half of the 16th century carried out with zeal the policy marked out for them by the Jesuits. To quote the language of Lord Macaulay: "Two reformations were pushed on at once with equal energy and effect — a reformation of doctrine in the north and a reformation of manners and discipline in the south. . . . In the Order of Jesus was concentrated the quintessence of the Catholic spirit; and the history of the Order of Jesus is the history of the great Catholic reaction." Thus the middle of the 16th century saw the tide of the revolution checked; and by the close of the century Europe was divided between the two forms of Christianity by almost the same lines as exist at the present day. To quote again from Macaulay: "As Protestantism had driven Catholicism to the Alps and Pyrenees, so Catholicism rallied and drove back Protestantism, even to the German Ocean; nor has Protestantism in the course of 200 years been able to reconquer any portion of what was then lost." See Calvin, Huss, Leo X, Luther and Wiclif. Consult Seebohm's *Era of the Protestant Revolution.*

Refrigera'tion is the art of producing cold by artificial means. The operation of cooling substances by some mechanical device has been practiced since very ancient times, but only in comparatively recent years have these devices been such as to enable the operation to be conducted profitably and on a commercial scale. Natural ice has always been a great source of refrigeration. In tropical countries such simple devices as porous jars placed in a draught have long been used for cooling the water with which the jars were filled. But in the highly developed civilization of recent times, with millions of people concentrated in cities sometimes hundred of miles from the sources of the food-stuffs desired, a limited supply of natural ice and simple refrigerating devices have not been sufficient, and necessity has given rise to many very elaborate and practical machines and refrigerating purposes. They are used for cold-storage warehouses, in which are stored for a time meats, fruits, vegetables and other perishable food-stuffs; for making artificial ice; on board ships; and for a large variety of manufacturing establishments. The various processes may be classed as (1) liquefaction, (2) vacuum, (3) compression, (4) absorption and (5) cold air. The third and fourth processes are used in the larger systems, while the others, especially the vacuum and cold-air processes, are used in smaller installations, as, for example, in domestic icemaking and on shipboard. Refrigeration by machinery has a great advantage over refrigeration by means of natural ice for use in storage-warehouses, in that the temperature can be better regulated and often the required temperature can be kept at a less cost. Artificial ice has an advantage over natural ice in that it can be made hygienically pure by first sterilizing the water.

Regillus (*rē-jĭl'ŭs*), anciently a lake in Latium, southeast of Rome, probably in the extinct volcanic crater of Corunfelle, which was drained in the 17th century. It is celebrated in the semilegendary history of Rome as the scene of a great battle in 496 B. C. between the Romans and the Latins, in which the Latins were totally defeated.

Regi'na, the seat of government for the Canadian Province of Saskatchewan, is the distributing point as well for a large area north and south. It is 1,885 feet above sea-level. Population about 45,000.

Regnault (*rĕ-nyō'*), **Henri Victor,** a French chemist and physicist distinguished especially for accurate measurements of a large number of physical constants. He was born on July 21, 1811, at Aix-la-Chapelle, and died at Paris, Jan. 19, 1878. He was educated at the Polytechnic School and at the School of Mines in Paris. After a few years of teaching chemistry at Lyons, he was called (1840) to the Polytechnic School as professor of chemistry, a position which he resigned a year later to accept the chair of physics at the Collège de France. It was here that he carried on his magnificent series of determinations of specific heat of various elements and compounds, and of the coefficient of expansion of various gases and liquids.

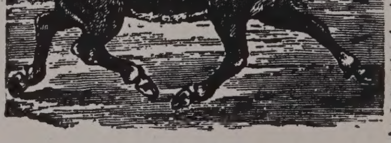
Regulus (*rĕg′ū-lŭs*), **Marcus Atilius,** a distinguished Roman, who was consul for the first time in 267 B. C. Chosen consul a second time, in 256 B. C., he was sent in connection with his colleague at the head of 330 ships against the Carthaginians, whom he totally defeated off Heraclea Minor. The Romans then landed at Clypea, and for some time Regulus was victorious in every encounter, but at last he suffered defeat and was taken prisoner. He was kept in captivity for years, but when fresh reverses caused the Carthaginians to sue for peace they sent Regulus to Rome, on parole, in company with their own envoys. It is related that when Regulus came before the Roman senate he urged that body to reject all the proposals of the Carthaginians, even to an exchange of prisoners, but to prosecute the war against that country with the utmost vigor until it was utterly subdued. After persuading the senate to adopt this course, Regulus refused to break his parole, and, without even waiting to see his family, returned to Carthage, where he was put to death (? 250 B. C.) with the most terrible torture.

Reichs′an′stalt, the great national physical laboratory of Germany, established in 1888 and situated at Charlottenburg, a suburb of Berlin. The object of this institution is twofold. Its first aim is to carry out investigation of a purely scientific character; such problems, for instance, as the change of density in water which accompanies a change of temperature, the laws of radiation etc. Its second aim is to act as a standardizing bureau, to which makers can send thermometers, resistance-coils, standard cells etc. to be tested and certified. The two functions are performed in different buildings. The first president of the *Reichsanstalt* and the controlling spirit in establishing it was Helmholtz, who conducted affairs from 1888 until his death in 1894. Kohlrausch succeeded him.

Reid, Thomas, an eminent Scottish philosopher, was born on April 26, 1710, at Strachan, a country parish in Kincardine, where his father was minister. He took his degree of M.A. at Aberdeen College in 1726, and continued to act as librarian there for a number of years. In 1737 he was appointed minister to the parish church of New Machar, at which he labored with zeal and success until 1752, when he was appointed one of the professors of philosophy in King's College, Aberdeen. In 1763 he was chosen to succeed Adam Smith as professor of moral philosophy in the University of Glasgow, and henceforth devoted himself to mental and metaphysical speculation. In 1764 he published his *Inquiry into the Human Mind;* in 1785 his *Philosophy of the Intellectual Powers;* and in 1788 his *Active Powers of the Human Mind.* These treatises must always be looked upon as constituting the first complete and systematic work on the constitution of the human mind. He died at Glasgow, Oct. 7, 1796. See his *Life* by Dugald Stewart and McCosh's *Scottish Philosophy.*

Reid, Whitelaw, editor and diplomat, was born near Xenia, O., Oct. 27, 1837, and graduated at Miami University, Oxford, O., in 1856, soon after which he commenced his literary and journalistic career by becoming editor and proprietor of the Xenia *News.* When the Civil War broke out, Mr. Reid accepted a position on the staff of the Cincinnati *Gazette*, and as its war-correspondent won a national reputation by his remarkable clearness of description and accuracy of statement. In 1868 Mr. Reid accepted a position on the staff of the New York *Tribune*, then edited by the famous Horace Greeley; and, when Greeley resigned in 1872, Mr. Reid was chosen to fill his place. When Benjamin Harrison became president in 1889, Mr. Reid was appointed United States minister to France, and during the two years he held that office discharged its functions in such a manner as to reflect high honor upon himself. In 1897 he was special ambassador of the United States to England on the occasion of the jubilee of Queen Victoria, and again at the coronation of Edward VII in 1902. He was appointed ambassador to the Court of Saint James in 1905. He published *A Continental Union* and *Problems of Expansion.* He died Dec. 15, 1912.

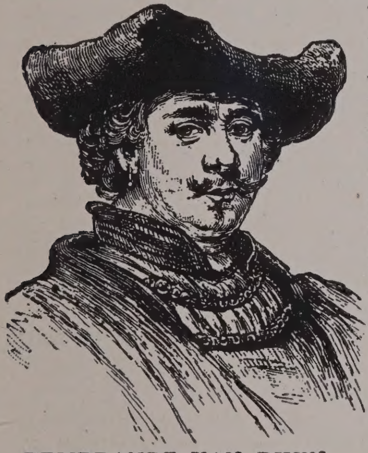
Rein′deer or **Car′ibou,** a kind of deer found in the northern parts of Europe, Asia and America. It can be distinguished from all its allies by the fact that both sexes have antlers. These are very large in comparison with the size of the animal, which is heavily built, with short limbs. The antlers have a brow-tine extending forward. In the American form the brow-tine of one side is aborted and the other is largely developed. The antlers, as well


REINDEER

as the hoofs, are used in removing snow from their food, which, in the winter, is a lichen called reindeer-moss. Reindeer yield good milk, and supply material for clothing, and in cold countries fill the place of horse, cow, goat and sheep. They are able to draw about 300 pounds, over the frozen snow, at nine or ten miles an hour. In much of Lapland and Siberia the land would be practically uninhabitable without them. They have long been domesticated in Lapland and Scandinavia. In 1889 the United States began to promote the propagation of reindeer in Alaska, and to instruct the natives in their care and breeding. See DEER.

Relativity, the basal theory of physics formulated by Einstein, on the principle that absolute motion through space can not be detected by any physical experiments. The theory effected a revolution in scientific thought by destroying the objectivity of time and space. The relativist argues that it is useless to provide a scale of absolute measurement in space; physicists have never considered a time-ether a necessity, why should there be a space-ether? It is hard to find practical cases which show the difference between Newton's theories and Einstein; two of these cases are the distortion of the oval orbits around the sun, and the deviation of light rays in a gravitational field.

Rembrandt (*rĕm′brănt*), **Hermanzoon,** commonly called Rembrandt van Rhyn, was born at Leyden, Holland, July 15, 1607. After attending the Latin school at Leyden and studying art under Peter Lastman at Amsterdam and under Jacob Pinas at Haarlem, he returned home and devoted himself to the study of nature. About 1630 he was encouraged to establish himself at Amsterdam, where he soon entered on a most successful career and executed numerous works, including those wondrous etchings, between three and four hundred in number, which have done almost as much as his paintings to give him so high and extended a reputation. Rembrandt's power and originality are exemplified in almost every branch of art, and as examples of composition, expression, color, light and shade his works rank with those of the greatest artists. He died at Amsterdam, Oct. 8, 1669.

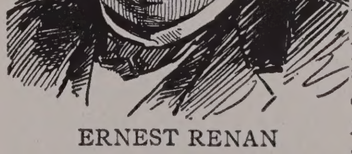


REMBRANDT VAN RHYN

Remen′yi, Eduard, a distinguished Hungarian violinist, was born in 1830 at Heves. Being obliged to flee because he took part in the Revolution of 1848, he came to America, but returned to Europe shortly after, and earned great fame by his skill as a performer on the violin.

Rem′ington, Frederick, 1861-1909, American artist, illustrator, sculptor and author, was born in St. Lawrence County, N. Y. He early studied at Yale Art School and at the Art Students' League of New York, after which he led the life of a cowboy and stockman on a ranch in Montana and Wyoming, where he became notable as an animal painter and illustrator of western scenes and modes of life on the plains. He subsequently came into note as an illustrator for magazines, treating of military subjects and of ranching life and, after the Spanish-American War, of Cuban scenes and characteristics. His chief canvases and best-known paintings are *A Dash for the Timber*, *The Last Stand*, *Past all Surgery*, *The Last Lull in the Fight* and *Conjuring the Buffalo Back.* Among his leading works in sculpture are *The Broncho Buster* and *The Wounded Bunkie.* He was the author of *Pony Tracks*, *Crooked Trails* and *Frontier Sketches.*

Rem′sen, Ira, distinguished American chemist and educator and successor to Dr. D. C. Gilman as president of Johns Hopkins University, was born at New York, Feb. 10, 1846. After graduating in 1865 from the College of the City of New York and in 1867 from the College of Physicians and Surgeons, he attended the Universities of Munich and Göttingen and for a time (1870-72) was assistant in chemistry at Tübingen. On his return to the United States he was professor of chemistry at Williams College, and in 1876 accepted the same post at Johns Hopkins.



ERNEST RENAN

Renan (*re-nän′*), **J. Ernest,** one of the most eminent authors of the 19th century, was born at Tréguier, France, Feb. 27, 1823. In his sixteenth year he was taken by Abbé Dupanloup to his seminary at Paris to be educated for the priesthood. After three years at this seminary, he entered St. Sulpice the great seminary of the diocese of Paris. At St. Sulpice his attention was mainly turned to the study of Hebrew, and to this study, of his own accord, he added that of German. The result of these studies was to destroy his faith in the supernatural or miraculous element in Christianity, and he therefore abandoned all idea of the priesthood and resolved to devote himself to literature. In 1860 Renan was appointed by Louis Napoleon a member of the commission to study the remains of Phoenician civilization. During this mission he visited Syria and Palestine and obtained acquaintance with the latter country, which enabled him to give such a vivid local coloring to his *Life of Jesus*, published two or three years after his return. In 1861 he was chosen professor of Hebrew at the College de France in Paris, but on account of his religious views was not fully established in that position until after the fall of the empire in 1870. His published works are quite numerous. Renan died at Paris, Oct. 2, 1892.

Reni, Guido (*gwē'dō rā'nē*), a celebrated painter, was born near Bologna, Italy, Nov. 4, 1575. He studied under Calvaert, and at 20 entered the school of the Caracci. His first works, among them being the *Coronation of the Virgin*, are harsh and high in coloring. About 1596 he removed to Rome, painting there the *Aurora and the Hours*, his best work, now at the Rospigliosi palace. On account of a quarrel with Cardinal Spinola he left Rome and returned to Bologna, where he died on Aug. 18, 1642. His works are to be found in all the chief European galleries.

Reno is situated in western Nevada at a pass through the high Sierra Nevada mountains. It is an important commercial center as railways, highways, and the transcontinental air route lead through the mountains at this point. The University of Nevada overlooks the city on a low plateau. Population, 20,000.

Reparations and the Ruhr. With the decline of the mark and the instability of the financial and political conditions of Germany, together with that country's protestations that French reparation demands were unjust, the Ruhr controversy has arisen. This small section of northwestern Germany lying along the Rhine and including Essen, Munster, and Bochun, is of vital importance to the life of Germany, for it contributes ¾ of the German coal supply and is the great center of Germany's iron and steel industry. This basin has been under the industrial control of Hugo Stinnes, the Thyssens, and other German industrialists. In 1920 German troops were sent to the Ruhr to quell a communistic uprising. France, seizing the opportunity, termed this a treaty violation, and sent troops into the Ruhr, but withdrew them May 27, after a month of occupancy. On Jan. 1, 1923, on failure of Germany to meet reparations, France sent troops into the Ruhr to gain control of the industries, regulating them with a view to enforcing payment. This has been met by Germany with a policy of non-cooperation. An inter-allied reparation commission, with Chas. Dawes among the U. S. representatives vigorously demanding common sense adjustment, met early in 1924 and formulated a plan which Germany has accepted.

Summary of Experts' Plan. One gold bank is to be established at Berlin which with minor exceptions shall be the only bank of issue. Capitalized at $100,000,000, this bank is to maintain a gold reserve of one-third its capitalization. A General Board is to govern this bank, which Board shall consist of seven German members and one member from each of the following countries: United States, Great Britain, France, Italy, Belgium, Holland, Switzerland. (This item was designed to prevent issue of worthless bank notes and to establish German currency on a sound financial basis.)

2. Payment of reparations is to be made by taxation and earnings of industries and railways. A sliding scale is established to regulate yearly payment of reparations, the maximum payment per annum of $625,000,000 plus supplementary amounts based on yearly rise or fall of general prosperity.

3. An international loan of $200,000,000 is to be extended Germany that she may place herself upon a sound financial basis in order to carry out the above stipulations.

4. The German railway system (owned by the German Government) shall be governed by a board composed of German and Allied members; its profits shall be used to pay the reparations in part and it shall be mortgaged to fund in part the international loan. German industry shall be mortgaged likewise to the sum of $1,250,000,000 to the Allies, interest on the mortgage to pay in part the reparations.

5. No statement of the total amount Germany is to pay is made.

This plan superseded the demand for $12,000,000,000 reparations for devastated areas, and $22,000,000,000 for pensions. The Allies abandoned this plan because if Germany were allowed to make that much money, world trade would be greatly disturbed.

Reptiles (*rĕp'tĭlz*), a class of vertebrates, embracing four natural orders of living forms: I. *Chelonia*, the tortoises and turtles; II. *Lacertilia*, the lizards; III. *Ophidia*, the snakes and serpents; IV. *Crocodilia*, the crocodiles, alligators etc. The hatteria of New Zealand is related to the lizards, but stands in a group by itself. In the evolution of life the reptiles were the forms that first became independent of the water and began to live entirely on land. Reptiles and birds, although so different in form and habits, are united by many peculiarities of structure. Huxley proposed a common name (*Sauropsida*) uniting the two classes. In addition to the living forms there are many extinct forms which extend the classification and best show the resemblances between birds and reptiles. The plesiosaurs were enormous water-animals with extremely long necks. Fossils are found indicating their length to have been about 40 feet. The ichthyosaurs were long water-animals attaining 30 or 40 feet in length. The dinosaurs show many bird-like pecularities. They lacked the power of flight and lived both on land and in the water. Some forms reached a length of 60 feet. The poterodactyls were flying reptiles with membranous wings, which in some cases had an expanse of 25 feet.

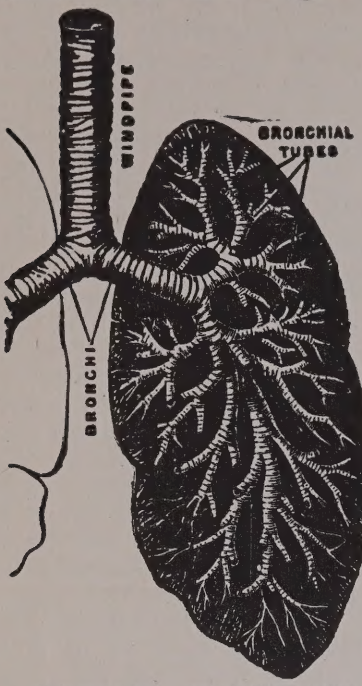
Repub'lic, Grand Army of the, is an organization composed of those who were soldiers and sailors in the Federal army and navy during the Civil War—the men in blue who upheld the flag and saved the Union. Its object is to preserve the spirit of comradeship among those who stood side by side amid the hardships and perils of war; to care for sick and disabled soldiers; to provide for the widows and orphans of those who fell in field or hospital or have since died; to stand by each other while living; and to bury those who answer the final call as the years go by. The organization was first suggested and planned by Dr. B. F. Stephenson of Springfield, Ill. The first post was organized early in 1866, and on July 12 of that year a meeting of representative soldiers from all parts of the state was held at Springfield, where they were mustered in and given authority to organize posts throughout the state. The organization grew rapidly and extended to other states. The posts in each state constitute a department, and the organization in 1910 had 5,923 posts, with a membership of 203,410. The losses by death in the preceding year were 9,151. The motto of the order is Fraternity, Charity and Loyalty. The badge of the Grand Army consists of an eagle and a star, connected by a ribbon representing the flag. A bronze button is also worn as an every-day insignia of the order. The order is strictly non-political, and none but honorably discharged soldiers can become members. There are frequent campfires, reunions and banquets, and once each year a grand, national encampment is held. At these meetings greetings are exchanged, memories are revived, the old songs of the war are sung again and the unwritten history of the war is recalled. Under the auspices of the order large sums are every year expended in charity. Hundreds of soldiers' and sailors' monuments have been erected, orphans' homes have been built and endowed in many states, and a helping hand has been given to thousands of old soldiers and soldiers' widows and orphans. The membership is now rapidly reduced each year by death.

Res'ins, a class of natural vegetable products, closely allied to the essential oils and in most cases obtained from the plants which yield them mixed with oil. Resins are divided into hard, soft and gum resins. Hard resins are solid and brittle, and contain little or no oil. Such are copal, lac, mastic, jalap etc. Soft resins can be molded by the hand, and some are sticky and semi-fluid. These are called balsams. They are the solutions of hard resins in essential oils, or are admixtures of the two. Turpentine, storax and the balsams of Tolu, Peru and Canada are examples. Gum resins are the milky juices of certain plants made solid by exposure to the air. Resins are widely diffused throughout the vegetable kingdom, and are much used in medicine and in the mechanic arts. They are generally obtained by making incisions in the wood from which they are obtained, although it is sometimes necessary to use boiling alcohol to extract them from the wood. The common resin or rosin of commerce exudes from several species of pine, and is used in the preparation of ointments and plasters and for various other purposes.

Resonance (*rĕz'ō-năns*), in physics the process by which one body sets in vibration another body having the same period of vibration. When one attempts to ring a large church-bell, he soon learns that he must pull the rope at certain definite intervals if he wishes to ring with ease. A row-boat moored in quiet water can, without difficulty, be set rocking if one throw his weight, first on one side then on the other, at correct intervals. If two pendulums of the same period be mounted upon one common frame, and then one pendulum be set in vibration while the second is at rest, the second pendulum soon "picks up" a vibration of considerable amplitude from the first pendulum. These are instances of resonance, taken from mechanics. In acoustics and electricity there also are many illustrations. A tuning-fork held over a tall jar partially filled with water will have its sound much reinforced when the column of air in the jar above the water is capable of vibrating in the same period as the tuning-fork. The sounding-box of the guitar and violin are in resonance with the strings and enable them to give out energy at a more rapid rate. Electrical resonance is frequently employed in wireless telegraphy. For a complete theory of resonance see Donkin's *Acoustics*.

Res'pira'tion (in plants) is the process by which most plants set free in their bodies the energy required for doing the work necessary to maintain life and form new parts. It essentially is identical with the respiration of animals. It consists of several separate but related processes: (1) the absorption of oxygen and its union with the protoplasm or with foods by the action of the protoplasm; (2) the decomposition of this unstable substance, resulting finally in the formation of carbon dioxide and water; (3) ridding the body of these waste products. The oxygen is absorbed directly from the water or air by smaller plants, but in the larger it is distributed to the internal tissues by a system of air passages (see AËRATION). Through a reverse process the carbon dioxide is got rid of. The chemical details of respiration are not known. It even is uncertain whether it is the living protoplasm or the foods that are oxidized. Neither is it known how the energy is used nor in what form it is set free. Some of it appears as heat, making the body warmer than the surrounding air. But this heat is so quickly lost that it can only be observed when dissipation of it is hindered. In this the plant is like a cold-blooded animal. On account of the carbon dioxide excreted, the plant loses weight, unless supplied with food; thus, if a seed germinate in darkness, after a few weeks the plantlet may have less than half the dry weight of the seed from which it grew.

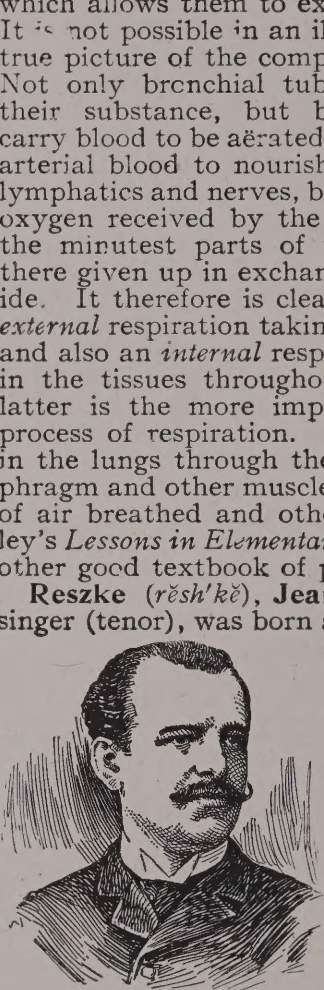
Respiration, Organs of, are of two kinds: Gills and lungs. The former are adapted for respiration in water, the latter for action in free air. Gills are found in clams, crayfish, squids and other invertebrates as well as in all fishes. The essence of respiration consists in an exchange of oxygen and carbon dioxide (CO_2) between the blood and the air Special organs of respiration are not necessary to accomplish this end. The earthworm, for example, breathes through the skin; that is, the blood comes close to the surface in thin-walled vessels, and the exchange between it and the air is accomplished. In the simplest animals, like the amœba, where there is no blood, the breathing is done by the protoplasm of the body, but the exchange of carbon dioxide for oxygen is essentially the same as in higher animals. It must also be understood that respiration (*q v.*) in plants is of the same nature as in animals. The old statement that plants breathe carbon dioxide (carbonic acid gas) in the sunlight, giving off oxygen, and in darkness reverse the process is not true. In breathing they take in oxygen and give up carbon dioxide at all times, and the process is more active in sunlight than in darkness. It is easy to point out how the erroneous idea in reference to their breathing arose. Plants use carbon dioxide in their process of nourishment, and they return free oxygen to the air as a left-over product. This comes mainly from the process of starch-formation; and, as that process takes place in the sunlight, it was at first supposed that the oxygen was set free in daylight from the process of respiration.



WINDPIPE, BRONCHI AND ONE LUNG

Fishes possess gills throughout life; the amphibia have them in larval stages, and, in some forms, both gills and lungs exist in the same individual. Lungs make their first appearance in the *dipnoi* (*q. v.*) and occur in all animals of a higher grade. Lungs are developed in all animals as sac-like expansions of the walls of the pharynx, blood vessels are spread over them, and air is introduced into the inside. In the human body the lungs become very complicated. The windpipe divides into two main branches — the bronchi. These enter the lungs, and are subdivided again and again into the bronchial tubes, which branch like the twigs of a tree. The smallest divisions enter into air-sacs, which are lobulated and have very thin walls. A network of capillaries is spread over the thin walls of the air-sacs, and it is in these capillaries that the exchanges between air and blood go on. The blood does not anywhere come into actual contact with the air, but the exchange of gases is made (by osmosis) through the thin membranes of the air-sacs and the capillaries. The substance of the lungs is spongy, and considerable elastic tissue enters into their structure, which allows them to expand and contract. It is not possible in an illustration to give a true picture of the complexity of the lungs. Not only bronchial tubes branch through their substance, but blood-vessels which carry blood to be aërated, others which carry arterial blood to nourish the lungs, besides lymphatics and nerves, branch through. The oxygen received by the lungs is carried to the minutest parts of the tissues, and is there given up in exchange for carbon dioxide. It therefore is clear that there are an *external* respiration taking place in the lungs and also an *internal* respiration taking place in the tissues throughout the body. The latter is the more important part of the process of respiration. The air is renewed in the lungs through the action of the diaphragm and other muscles. For the amount of air breathed and other details see Huxley's *Lessons in Elementary Physiology* or any other good textbook of physiology.

Reszke (*rěsh'kě*), **Jean de,** an operatic singer (tenor), was born at Warsaw, Poland, on Jan. 14, 1853. He attained a reputation as a singer while a boy; and, although he had been destined for a lawyer, he soon quitted his profession for the operatic stage. He appeared in 1874 in Venice and in 1875 in London, singing a barytone part; but was convinced that his voice is more truly a tenor. Accordingly he re-appeared in 1879 as a tenor, and is now recognized as one of the world's finest artists in *Robert le Diable*, *Faust*, *Lohengrin*, *Aida*, *Le Cid*, *Tristran* and *Romeo and Juliet*. Jean de Reszke was a favorite performer for a long period of years at the Metropolitan Opera House, New York.



JEAN DE RESZKE

Retort′, a vessel employed by chemists for distilling or effecting decomposition by means of heat. It may be made of glass, earthenware or mental according to the purpose for which it is to be used. Glass retorts are the most common; but, in cases requiring a higher degree of heat than glass can bear, earthen retorts are used, and iron retorts are necessary in the laboratory for many processes.

Reunion is an island belonging since 1764 to France, formerly called Ile de Bourbon, southwest of Mauritius and about 420 miles east of Madagascar. It has a total area of 965 square miles and a population of 173,315. It is administered by a governor, privy council and elected legislature; is represented in the French Parliament; and includes 30,000 Chinese, Hindus, Malagasi and Negroes among its non-European residents. St. Denis, the capital, had a population of 27,392; There are 161 schools with 16,827 pupils. The principal seaport, Pointe-des-Galets, is connected with St. Benoit and St. Pierre by a railway 83 miles long belonging to the government. The chief imports are rice and grain; the exports, chiefly sugar, rum, coffee, vanilla and spices.

Reuter (*roi'tẽr*), **Fritz,** a novelist and poet who wrote in the Low-German dialect, was born at Mecklenburg-Schwerin, Nov. 7, 1810. While studying law at Jena in 1833, he became involved in some of the revolutionary schemes of the students' association, and was arrested and sentenced to thirty years' imprisonment. He was released after seven years' confinement in Prussian fortresses; and a few years later began to write the books which spread his name throughout all Germany. His tales have the flavor of real life, and prove their author a born story-teller. He died at Eisenach in Thuringia, July 12, 1874. See M'Callum's *Studies in Low-German Literature.* See PLATT-DEUTSCH.

Revere', Mass., a coastal town in Suffolk County, is five miles from Boston. It is a residential town and a popular summer resort, having good schools and a number of churches. It has a memorial to Paul Revere, a town-hall, a Carnegie Library and Massachusetts Bath-House, which is owned and maintained by the state. The town was settled in 1627, and was known as Rumney Marsh. It was part of Boston until 1738, and in 1739 it was incorporated as Chelsea. It was re-incorporated and set off in 1846 as North Chelsea, and in 1871 the name was changed to Revere. Population 38,000.

Revere, Paul, a Revolutionary soldier famous for his midnight ride from Boston to Lexington to warn the militia of the approach of the British soldiers, was born at Boston, Jan. 1, 1735 Revere was one of the party that destroyed the tea in Boston harbor, and was at the head of a volunteer committee to watch the British. When it was known that the latter intended to move to Concord, Revere crossed to Charlestown and on the night of April 18, 1775, rode to Lexington, rousing the minute-men on his way. "The fate of a nation was riding that night." He was stopped at Lexington, but a companion succeeded in reaching Concord. Revere rose to the rank of lieutenant-colonel of artillery during the war, and after independence was secured established the Revere Copper Company at Canton, Mass. He died on May 10, 1818. His ride has been made the subject of a fine poem by Longfellow.

Revolv'er, a small fire-arm, an improved pistol, which by means of a revolving breech or revolving barrels can be made to discharge more than once without reloading. The invention is far from being new, specimens being still in existence which were manufactured during the 17th century: but in 1835 Colonel Samuel Colt patented Colt's revolver, which was a great advance on all previous experiments and substantially is still in use. It consists of one rifled barrel and a revolving cylinder with six or seven chambers, which are successively brought into line with the barrel by the action of the trigger. Each chamber has its nipple for a cap, which is brought under the hammer by the motion which brings the chambers around to the barrel. In addition to this, by withdrawing a bolt the breech-piece may be taken out and replaced by another of the same kind with chambers ready loaded. Revolving fire-arms of larger size are used in wars, the best known of which is the French *mitrailleuse,* of which so much was heard during the Franco-Prussian War of 1870. See GUN.

Rey'nard the Fox is the title of a celebrated fable of the middle ages, being the last of a series of poems in which wild beasts are the speakers and actors. It was written in Low German, professedly by Hinrik van Alkmer in 1498; but most German critics say the real author was Hermann Barkhausen, who published his book under a pseudonym.

An outline of the story may be briefly given as follows: When Nobel the lion, king of beasts, was holding his court one Eastertide, all the animals, great and small, came and paid homage, except Reynard the fox; and for his various misdeeds Reynard was summoned to appear before the lion, Bruin the bear being sent to summon him. Reynard, however, told the bear of some honey hid in a split tree, in which Bruin got himself fast and nearly beaten to death by some peasants before he got back to court. Tibert the cat was the next messenger; but Reynard persuaded him to go and catch some mice in a place where there was a noose. in which the cat was caught and suffered a beating before he got away. At last Grimbart the badger went to summon Reynard and persuaded him to appear at court, where he was tried and condemned to death. But just before he was to be hung on the gallows he asked leave to make a speech, in the course of which he told the lion that old Reynard his father, in connection with Isengrim the wolf and Bruin the bear, had formed a conspiracy to kill the lion and make Bruin king in his place; but he (Reynard) had stolen their treasure and hidden it, as he could not bear to see the noble lion killed and the wicked bear made king in his place. After hearing the story, the lion pardoned Reynard and put the wolf and the bear in prison. But when the lion asked Reynard to show him where the treasure was, he excused himself because he was under an oath to make a pilgrimage to Rome. The lion then let him go; and Reynard immediately set out on his pilgrimage, taking with him Cuwært the hare and Belin the ram. On his way he passed his own house, and induced Cuwært to go with him, and there killed him. Putting the hare's head in a satchel, he gave it to the ram, telling him to carry it back to the lion, as it contained valuable letters. When the lion saw the hare's head he was very angry, and at once released the wolf and bear from prison and declared the fox an outlaw. Another version of the fable adds an account of a fight between the wolf and the fox, in which the latter by his trickery won the victory, and finally returned to his own home, honored with the favor and protection of the lion.

Reyn'olds, John Fulton, an American soldier and major-general of volunteers, was born at Lancaster, Pa., Sept. 20, 1820. He graduated at West Point in 1841 and got a lieutenancy in 1846, after which he served in the Mexican War, was engaged against the Rogue River Indians in the Utah expedition and in 1859 became commandant of West Point. In 1861 he was appointed brigadier-general of volunteers, and took part in the campaigns of the army of the Potomac. After serving with distinction in the Peninsular campaign and saving the Union army at the second battle of Bull Run from a disastrous rout, he gained the rank of major-general and succeeded Hooker in the command of the First Army Corps. On the first day at Gettysburg he was struck by a rifle ball, which unhappily ended his promising career, July 1, 1863.

Reynolds, Sir **Joshua,** a highly distinguished English portrait-painter, was born near Plymouth, July 16, 1723. His father designed him for the medical profession, but, as he early manifested a desire to be a painter, he was placed at 17 under the instruction of Thomas Hudson, the principal portrait-painter of the day. In 1746 he went to London, and set up a studio there; but, being invited to accompany Commodore Keppel on a cruise to the Mediterreanan in 1749, he made his way to Rome, and remained about three years in Italy, studying the works of Raphael and Michael Angelo and visiting the chief art-collections. On returning to London in 1752, his works attracted great attention. When the Royal Academy was instituted in 1769, he was elected its first president. He was knighted by George III. When Ramsay died in 1784, he succeeded him as painter to the king. He died in London, Feb. 23, 1792, and, after lying in state at the Royal Academy, was interred in the crypt of St. Paul's. Reynold's fame lies in the superior beauty and excellence of his portraits. He was at home alike in portraying the strength of manhood and the grace of womanhood; and his pictures of children have especial tenderness and beauty. He was a man of fine and varied culture, and lived in friendly intercourse with Johnson, Burke, Goldsmith and other literary men of his day. He was also distinguished for an amiable disposition and the most pleasing manners, fully justifying the eulogium of Goldsmith:

> Still born to improve us in every part,
> His pencil our faces, his manners our heart.

Rhad'aman'thus, in Greek mythology, a son of Zeus and Europa; one of the three judges of the dead on their descent into the nether world. The other two were Æacus and Minos (brother of Rhadamanthus), king and lawgiver of Crete. Before these three, according to the fable, all the dead appeared when they reached the lower world, to give account of their stewardship and receive the reward of their deeds.

Rhea (*rē'ȧ*) or **Nan'du,** the ostrich of the New World. The rheas are running birds, living in herds on the grassy plains of South America and feeding on grasses, seeds of herbs and some varieties of berries. Their wings are better developed than in other running birds, but do not suffice for flight. The larger varieties reach a height of about six feet. The female lays from ten to twenty-three eggs in a depression in the ground made by the male. Their feathers are of coarser quality than those of the African ostrich, and are used mainly for rugs, dusters and brooms. There are three species. The more common one is brownish-gray above and nearly white on the belly. It ranges from southern Brazil to the Straits of Magellan. Another smaller form, with some feathers having white tips, inhabits Patagonia; and a third, dark-colored form lives in northeastern Brazil.

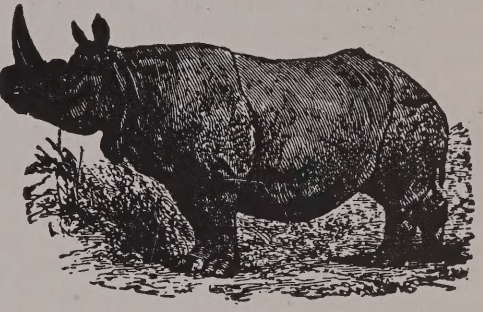
Rheims (*rēmz*) or **Reims,** a city in the French department of the Marne, about 100 miles from Paris by rail. Clovis was baptized within its walls. In the 8th century it became the seat of an archbishop, and from 1179, when Philip Augustus was solemnly crowned here, it became the place for the coronation of the kings of France. Joan of Arc, after her great victories, brought the dauphin here to be crowned, and the only sovereigns down to 1825 who were not crowned here were Henry IV, Napoleon I and Louis XVIII. In 1793 the cathedral was attacked by the populace, and in 1830 the ceremony of crowning at Rheims was abolished. The hills which surround the town are planted with vineyards, and Rheims is one of the great centers of woolen manufacture in France. Its Gothic cathedral, one of the glories of architecture was ruined by German bombs in 1914. A wealth of tapestry, sculpture and paintings adorned the interior; innumerable statues of artistic grace beautified the outside; and the rose-window was of rare magnificence. Population 108,385.

Rheingold (*rīn′ gōlt*), **Das.** The prelude of Wagner's tetralogy of *The Niebelungen Ring.* First performance at Munich, Sept. 22, 1869, under the direction of Franz Wüllner, whose tact and ability successfully overcame the difficulties attending its first production. The poem, *Das Rheingold*, was not written until after *Siegfried* and *Die Walküre* had been dramatised. The music was completed in May of 1854. An exceptional number of instruments is required by the score. For instance, where ordinarily two or four horns would suffice, Wagner uses eight. The band of brass instruments is enlarged, with wonderful effects in sonority. At the close of *The Rhinegold* six harps are used in the rainbow scene. The full score was published in 1873.

Rheot′ropism the sensitiveness of a plant to the direction of a current of water, to which it responds by changing the rate of growth, which results in a curvature with or against the current. When roots of corn or vetch are grown in moving water, the rate of growth is hastened on the side not struck by the current and slowed on the other side; consequently the tip is turned up-stream. A very slow current will produce the reaction. The exact nature of the stimulus has not yet been determined. See IRRITABILITY.

Rhine, the most important river in Germany and one of the most noted in the world, takes its rise in Switzerland, and, after a northerly course of about 850 miles, empties into the German Ocean. The area drained by the Rhine and its feeders is estimated at nearly 100,000 square miles. It is divided into the Upper, Middle and Lower Rhine, the first being the river from its source to Basel, the second its course from Basel to Cologne and the third its course from Cologne through the Netherlands to the sea, into which it empties by mouths forming an extensive delta. Canals connect the Rhine with the Rhône, the Danube and other rivers, opening lines of communication with France and Belgium on one side and with the Netherlands and every part of Germany on the other. The delta, most of which lies below the sea, has to be protected by strong embankments or dikes, the principal ones rising 25 or 30 feet above the lowest level of the river.

Rhinoceros (*rī-nŏs′ē-rŏs*), a thick-skinned animal with a horned snout, confined to tropical Africa and Asia. There are two species in Africa and three in Asia. The African species embrace a two-horned and a one-horned variety. The latter is the wide-mouthed rhinoceros, sometimes called white, although its skin is of a slaty color. It is the largest of the family, a full-grown male, according to Selous the celebrated hunter, standing six and one half feet high at the shoulders. The largest of the Asiatic species also has a single horn. It is ten feet long and five feet high at the shoulders. There are enormous folds in the skin which appear like huge plates of armor. Another form, inhabiting Sumatra, has two horns on the snout. The horn is a powerful weapon. Besides being used in attack, it is strong enough to root up small trees, which the animal sometimes does, for the sake of the fruit and foliage. They are shot with iron and tin bullets, as the hide is so tough that leaden bullets will not penetrate it.



INDIAN RHINOCEROS

Rhizoids (*rī′zoids*). Usually hair-like outgrowths from plant-bodies which act as holdfasts and, often, as absorbing organs. The name means root-like, but the similarity is by no means one of structure, but rather one of general function in relation to the outside world. Rhizoids are mostly developed by the lower plants, as, for example, in connection with the anchoring of sea-weeds, on the underside of the thallus-bodies of liverworts, from the base of the erect moss-plants, from the under side of the prothallium of ferns etc.

Rhizome (*rī-zōm′*). See ROOT′-STOCK.

Rhode Island, one of the original thirteen states and the smallest state in area in the American Union. Its greatest length from north to south is between 40 and 50 miles, and its width is less than 40, its land-area being but little over 1,050 square miles. It is bounded on the north and east by Massachusetts, on the south by the Atlantic and on the west by Connecticut. The state is divided into five counties, its principal cities being Providence (the capital), Newport, Central Falls, Pawtucket and Woonsocket. Narragansett Bay, which occupies the southeastern quarter of the state, contains a number of beautiful islands, on the largest of which, named Rhode Island, is Newport, a famous summer-resort, formerly one of the two capitals. The country is hilly, and the soil rough and stony, being chiefly devoted to pasturage and orchards. The minerals consist of building-stone, talc, lime and graphite. The principal rivers are the Pawtucket, Blackstone and Pawcatuk In the main they supply waterpower for the numerous factories.

Rhode Island is a manufacturing state, having nearly 300 million dollars invested in various enterprises. The principal lines of industry are cotton, woolen and knit-goods factories. There also are dyeing and finishing establishments; foundry and machine-shop products and rubber and elastic goods are manufactured. Much cheap jewelry is made, and no better solid silverware is manufactured in the United States than in Rhode Island. The fisheries employ about 2,000 people and have a valuation of one million dollars annually. It was at Pawtucket in 1790 that the first cottonspinning works in the United States were established. Educationally the state does most creditably, expending nearly two million dollars a year. The pupils enrolled number 80,110, and the average daily attendance is 61,487. It has 247 high-school teachers and 6,021 high-school pupils. The state maintains a normal school with 38 teachers and an agricultural school with a faculty of 25. At Providence is Brown University (*q. v.*). There are a state sanitarium for consumptives, a state home and school for children, institutions for the deaf and insane, a state work-house, house of correction, a state-prison and many benevolent establishments.

Rhode Island was settled in 1636 by Roger Williams (*q. v.*) and his Baptist companions, who were expelled from the Puritan colony in Massachusetts on account, partly, of their religious opinions. It is also believed to have been the Vinland of the Norsemen, who explored its coast in the 10th century. Population 620,090.

Rhodes (*rōdz*), an island in the Mediterranean belonging to Turkey, formerly an independent state of ancient Greece. It is about 50 miles long and 20 broad, and is traversed by a chain of mountains, the highest peak reaching a height of 4,070 feet. The island was inhabited at a very early period, and is said to have sent nine ships to the Trojan War. In 404 B. C. the city of Rhodes was founded at the northern extremity of the island, and after that the history of the island is comprised in that of the new city. The city was girt by strong walls surmounted by towers, and was furnished with two good harbors. At the entrance to one of its ports stood a brazen statue of Helios, 70 cubits in height and called the Colossus of Rhodes. Besides this statue, which was one of the seven wonders of the ancient world, there were 3,000 others in the city, of which 100 were colossal. The arts were cultivated in Rhodes, and intellectual activity showed itself long after it had declined in other parts of Greece. After the death of Julius Cæsar, whose side the Rhodians had taken in his contest with Pompey, they were defeated in a naval engagement by Cassius, who entered the city by force, seized the public property and rifled the temples. During several centuries Rhodes remained under the power of the Byzantine emperors. In 1309 it fell into the hands of the Knights of St. John of Jerusalem, who retained possession until 1523, when they were besieged by the Turks and compelled to sail away to Crete; and the island has remained a Turkish possession ever since.

Rhodes, Cecil John, English and South African statesman, railway projector and mining operator, was born at Bishop Stortford, England, where his father was rector of the parish, July 5, 1853. After graduating at Oxford, he went to the Cape of Good Hope in 1871 for his health, and settled at Kimberley, engaged in diamond-mining and began to dream of a united British South Africa and of a railway project that would connect the Cape with the Zambezi and ultimately through Egyptian Sudan with Cairo. Cape politics for a time attracted him, and he entered the local legislature and became prime minister, but resigned in consequence of the Jameson raid. In 1893, in alliance with the Dutch Afrikander party at the Cape, he took the field against the warlike Matabele and subdued them; after which he obtained mining rights over what is now Rhodesia, which he did much to develop. By this time, while working out his schemes of British expansion in the country, he had formed the great De Beers mine consolidation, where he amassed great wealth. When war in the Transvaal broke out, he went to Kimberley, and remained there during the investment of the great diamond-mining town by the Boers, raising and equipping at his own expense a town-guard of 400 men at a cost of $75,000. He died on March 28, 1902.

Rhodesia (*rō-dē′zĭ-ȧ*), named from Cecil Rhodes, is bounded on the northwest and north by Congo Free State, on the north and northeast by German East Africa, on the east by Portuguese East Africa, on the south by the Transvaal and the Bechuanaland Protectorate, and on the west by German Southwest Africa and Portuguese West Africa or Angola, comprising all the territory formerly known as British South and Central Africa, north of the twenty-second parallel, excepting the British Central Africa Protectorate. Rhodesia is divided by the Zambezi into Southern and Northern Rhodesia, Southern Rhodesia into Matabeleland and Mashonaland, and Northern

Rhodesia into Northeastern and Northwestern Rhodesia. Southern Rhodesia has an estimated area of 144,000 square miles and a native population at present estimated at 743,640, 497,165 in Mashonaland and 246,475 in Matabeleland. Census figures give 11,039 Europeans in the former and 12,543 in the latter province. The entire country is administered by the British South Africa Company through its administrator and by a resident commissioner appointed by the secretary of state, with executive and legislative councils. Natives and non-natives stand equal before the law except in regard to spirits and arms and ammunition.

Gold-fields with a total estimated area of 5,250 square miles have been discovered in Rhodesia, and 300 companies and syndicates had registered for mining and development work before 1906, and the extension of mining operations has gone on very rapidly ever since. There are 600 square miles of coal-fields about Wankie, 203 miles northeast of Bulawayo, and a company has been formed for their exploitation. Silver, copper, antimony, blende, arsenic and lead have been found. Southern Rhodesia belongs to the South African Customs-Union. The railway from Bulawayo to the Wankie coal-fields was finished in September, 1903, and 212 miles were thus added to the line up the continent from the Cape. On April 25, 1904, it had been pushed on to the Victoria Falls on the Zambezi, and the road's main line now forms the southern link in the great Cape to Cairo Railway and Steamboat Service. A branch-line from Bulawayo to Gwanda, 120 miles south, was opened in 1903, and the line to the Matopos the same year.

Salisbury is connected with Bulawayo by way of Hartley and Gwelo, and, as a result of specially energetic effort, the line from Beira to Umtali has also reached Salisbury, the narrow gauge of the latter having been standardized. Salisbury is also connected with the Ayrshire mine in the Lomagundi district by a narrow-gauge road, a distance of 84 miles. The line between Gwelo and Selukwe is also open for business. The route between Salisbury and Mazoe has been surveyed for immediate construction. Nearly 3,000 miles of railway have been built in northern and southern Rhodesia. In Southern Rhodesia there are 3,000 miles of post-roads, maintained at a cost of over £8,000 a year. The Rhodesian telegraph-system, including the African Transcontinental Telegraph Company's lines and those belonging to the police-telephone service, aggregated 3,984 miles of line and 7,118 of wire, with 99 offices open. Direct communication by wire is opened between Umtali and Beira, and the trunk-line, now 1,600 miles long, has reached Ujiji by way of Blantyre and Karonga. The telephone systems are extensive. The penny-post prevails, and there are 73 postoffices in Southern and 35 in North Rhodesia.

Northern Rhodesia, formed by the amalgamation of Northeastern and Northwestern Rhodesia in 1911, has an area of about 190,000 square miles and a population of approximately 1,000,000. The Europeans number 1,434. The territory is divided into ten magisterial districts, with administrative headquarters at Livingstone, on the Zambesi. A good road exists between Lakes Nyasa and Tanganyika and the telegraph line runs from Zomba in the Protectorate to Ujiji. The slave-trade has been suppressed throughout the country, and strict regulations regarding spirits and trading with the natives are in force.

The authorized capital of the British South Africa Company is £9,000,000, of which nearly all has been issued, besides £1,250,000 in debentures. The total annual revenue of this great corporation is more than £1,000,000 or $5,000,000 in American money.

Rhodes Schol'arships. Cecil Rhodes (*q. v.*) of South Africa by his will endowed a large number of perpetual scholarships entitling each of the recipients to spend three years at England's famous University of Oxford, with an annual income of $1,500. These scholarships are distributed among English-speaking people throughout the world, each state and each territory in the United States being entitled to two representatives. Mr. Rhodes' object was to bind all English-speaking people in sympathy and esteem, by means of the social contact and the mutual understanding which such a plan should bring about.

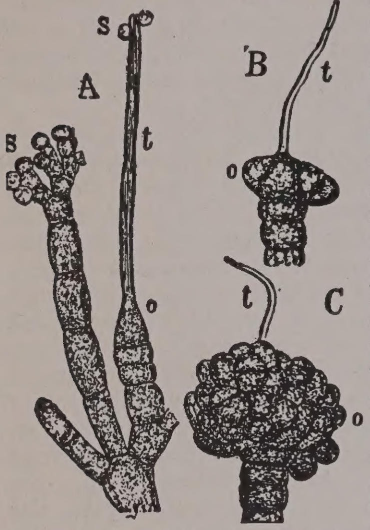
The candidates are selected on the basis of these four qualifications: (1) Attainments in scholarship, as tested by preliminary examinations in Latin, Greek and mathematics; (2) fondness for and success in outdoor sports; (3) unselfishness and good fellowship; and (4) moral force of character and zeal in the performance of public duties.

It would seem that those best suited for the scholarships are those who have already received the A.B. degree, as the majority of those who have not attained to this standard lack the breadth and maturity necessary for profiting fully from the splendid opportunities afforded by the social life at Oxford.

The first of the Rhodes scholars began their residence at Oxford in 1903, and those who have recently returned to America report high respect for British institutions.

Rho'doden'dron, a genus of trees, shrubs and various forms of heath, which includes some 200 species, is an evergreen, in many of its species native to North America and in many others to Asia and, especially, the Himalayas, Borneo and Java. Rhododendrons have been cultivated as garden-plants with great success. Many hybrid forms have beautiful and conspicuous flowers, without having lost the hardiness of the native species. The plants of the genus flourish in a moist but well-drained soil, preferably somewhat of the nature of vegetable mould. Thickets of *rhododendron maximum* are among the beauties of the Alleghanies, some having carmine, others lilac-colored, others purple flowers.

Rhodophyceæ (*rō'dō-fĭs'ē-ē*), plants commonly known as the red algæ. The red color is due to the presence of a pigment in addition to the ordinary chlorophyll which belongs to all algæ. They mostly are marine forms and are anchored by holdfasts, belonging to the deepest waters in which algæ grow. Their bodies are much more delicate than those of the brown algæ or kelps, their graceful forms, delicate texture and brightly tinted bodies (shades of red, violet, dark purple and reddish brown) making them very attractive. They show the greatest variety of forms, branching filaments, ribbons and filmy plates prevailing, sometimes branching very profusely and delicately and resembling mosses of fine texture. They are among the most prized souvenirs of a visit to the seashore. Red algæ are very peculiar both in asexual and in sexual reproduction. Every sporangium contains just four asexual spores, and, contrary to the usual alga habit, these spores have no cilia or power of motion. Since they are always produced in fours, they are called tetraspores. The female sex-organ also is very peculiar. In the ordinary algæ the oögonium consists of a single, large, spherical cell. Among the red algæ, however, this spherical cell is transformed into a flask-like body, with bulbous base and an elongated, almost hair-like neck. This female organ, on account of its peculiarities, is often called by a special name, carpogonium, the tubular hair-like process being called the trichogyne. The male cells come in contact with the trichogyne in the process of fertilization.



A red alga (*A*), showing the female organ (*o*) with its trichogyne (*t*), the male cells (*s*) and the resulting spore case (*B*, *C*).

Rhone (*rōn*), the only important French river which falls into the Mediterranean, rises in the Swiss Alps not far from the sources of the Rhine, its entire length being about 500 miles. There is sufficient depth for good-sized vessels from Lyons southward, but, on account of the rapidity of the current and the shifting of sand-bars, navigation is difficult and at times impossible. On account of these obstructions, which are greatest near the mouths of the river, communication with the Mediterranean is in great part dependent upon the canals which connect the Rhône with the Rhine, the Seine and other rivers.

Rhu'barb, species of *Rheum*, a genus of the buckwheat family. Common garden rhubarb or pie-plant is *R. rhaponticum*, native to the Old World. The genus is very closely related to the common docks, many of which resemble the rhubarb in habit.

Ribault (*rē'bō'*), **Jean,** a French Huguenot, was born at Dieppe about 1520. He was sent by Admiral Coligni to establish a colony of French Protestants in North America. He set sail with an advance party on February 18, 1562. Having built a fortress at Port Royal Harbor, he left a garrison of 30 men in charge and returned to France. He found the country in the throes of civil war and was unable to return or to send provisions. After enduring great sufferings the men abandoned the fort and attempted to return to France, in an old vessel which managed to hold together for a time. When it was about ready to collapse, the men fortunately were picked up by an English cruiser and taken to London. In 1564 Ribault was made governor of a proposed colony in Florida and René de Laudoniere was sent out with colonists. In May of 1565 Ribault again sailed, this time with seven vessels and 300 men. He arrived on August 28, and shortly afterward some Spanish colonists under Menendez de Avilez made an attack upon his ships. He set out to retaliate, but his vessels were wrecked by a storm and he was obilged to attempt to return to the fort overland. In the meantime the Spaniards had marched overland, captured the fort and murdered all the occupants, except a few who made their escape in a couple of old vessels. Ribault and his men surrendered to the Spaniards under assurances of safety, but in October of 1565 they were put to the sword.

Rib'bon, a narrow band or strip of woven silk. Ribbons have been made an important article of commerce only during the last two centuries, the chief seats of their manufacture being Etienne, France; Basel, Switzerland; and Coventry, England. Of the names which indicate the kind of groundwork, grosgrain is a ribbed silk, plush a velvety or piled surface, satin a smooth, polished surface etc.; and there are various mixtures of these, making an almost infinite variety of decorative effects both in color and weaving.

Ricardo (*rĭ-kär'dō*), **David,** an eminent political economist, was born of Jewish parentage at London, April 19, 1772. At an early age he became a partner with his father as a stock-broker; but, when he married outside the Jewish race, a misunderstanding arose between them and the partnership was dissolved. Young Ricardo then set up in the same business himself, and in a few years realized a large fortune, while preserving an honorable reputation throughout his business career. In 1809 he published *The High Price of Bullion a Proof of the Depreciation of Bank-Notes*, which was a clear and able argument in favor of a metallic basis for the currency of a country. After publishing a number of other successful pamphlets, Ricardo brought out his greatest work, the one on which his fame chiefly rests: *The principles of Political Economy and Taxation.* This work, while not a complete treatise on political economy, may be regarded as a very able discussion of some of its principal factors, as value, wages, rent, etc. Ricardo entered Parliament in 1819, and retained his seat in that body until his death, which took place at Gatcomb Park, Gloucestershire, Sept. 11, 1823.

Rice, the well-known grain of *Oryza sativa*, extensively cultivated in Asia, where it is also native. The genus belongs to the grass family and contains about 20 described species, and perhaps these may all be considered as varieties of *O. sativa.* Rice supplies food for more human beings than does the product of any other plant. It is the principal, and often the only, food of millions in China, India and the Maylayan Islands. It is the staple crop of China, and two food-crops a year are raised, while a third is plowed under as a green fertilizer. The Chinese do not always grow rice on alluvial flats, but cultivate a dry-soil variety on hill-slopes as if it were an ordinary cereal, only irrigating it. In India between a third and a half of all the land cultivated is given to rice-growing. In Bengal it is the staple crop, and the hill-tribes in all parts of India also raise rice. In 1647 Sir William Berkeley tried to raise rice in Virginia, but the experiment failed. In 1694, however, Thomas Smith of Charleston, S. C., grew almost enough to meet the needs of the colony, and the American rice-industry began. Water-culture began in 1784, and the superiority of American rice was well-established long before 1860. But since 1865 a still better quality has been produced. Before the Civil War Georgia and the Carolinas were the only states in which rice was raised to any great extent. Though they still retain their rice-fields, Louisiana and Texas have taken gigantic steps as growers of rice. In 1900 Louisiana was supplying 80 per cent. of all the rice raised in the United States. The opening of the Calcasieu country — southwestern Louisiana from Atchafalaya River to Sabine River — called attention to Texas as a possible producer of rice. Experiments resulted so satisfactorily, that in 1905 Louisiana had ceased to raise so enormous a percentage of the American crop. Though Texas before 1900 grew practically no rice, its annual production is now second only to that of Louisiana. The total crop of the United States annually is 24,368,000 bushels, worth $12,000,000. South Carolina raises 476,000 bushels; Arkansas 1,120,000; Georgia 100,000; Florida 25,000; Alabama 35,000; Mississippi 30,000; and North Carolina 13,000. (Total about 24,000,000 bushels, including the yield from Louisiana and Texas.)

American rice-fields consist of reclaimed cypress-swamps and tidewater lands along the coast or of marshes higher up the rivers or in the interior upon level tracts, if these are so situated that they can be easily irrigated. The plant needs high temperature in summer and plenty of water, the amount depending on the strength of the plant and its state of growth. The seed, when planted, is wet thoroughly in order to make sure that it will sprout. When the plant appears, the soil is flooded four or five inches, the water standing till the leaves float. Then it is drawn off, the soil cultivated, and the plant allowed to take firm root. Then it is flooded again, the water staying till the rice is ripe. In order to protect tidal lands against salt-water, which would kill the rice, they are surrounded with dikes which prevent the tide from reaching them and freshets from flooding them.

Rich'ard I of England, surnamed the Lion-Heart, was born at Oxford, Sept. 8, 1157, and by the death of his father, Henry II, became king on July 6, 1189. Being a born soldier and thirsting for military glory, soon after his coronation Richard raised a large force of soldiers with which he joined the third crusade, then about to leave Europe for the Holy Land. He united his forces with those of Philip, king of France, at Vezelai; but at Lyons the two armies, numbering in all about 100,000 men, separated and proceeded by different routes to Sicily, where they again met. Here Richard betrothed Arthur, his nephew, to the infant daughter of Tancred, king of Sicily, with whom he formed a close alliance. On June 4, 1191, Richard reached the camp of the crusaders, then assembled near Acre, and shortly afterward that stronghold surrendered, the siege having lasted two years. Richard's march to Joppa along the seashore, his advance upon Jerusalem at Christmas, his capture of the fortresses in the south of Palestine, his second advance upon Jerusalem (the city he never beheld), his relief of Joppa — these and other deeds gave him a great name for heroism and valor, but brought no decisive advantage to the crusade. On Richard's way home in 1193 he was shipwrecked in the Adriatic. Wandering in disguise through the dominions of his enemy, the archduke of Austria, he was recognized, seized and handed over to Emperor Henry VI. Being ransomed by his loyal subjects, Richard returned home the next year, and almost immediately afterwards engaged in war with Philip of France, in which he was killed by an arrow shot from the castle of Chaluz, near Limoges, April 6, 1199.

Richard II of England, second son of the Black Prince and Joanna of Kent, was born at Bordeaux, April 13, 1366, and succeeded to the throne on the death of his grandfather, Edward III, June 28, 1377. His reign is an interesting epoch of English history, as the newly-established house of commons was eager to claim a share of political power and the laboring classes were seeking to be freed from the bondage under which they had so long suffered. During the first years of Richard's reign — he being only 11 when he came to the throne — the government was intrusted to a council of 12. Although John of Gaunt, the king's uncle, was nominally excluded from this council, he was generally regarded as the real head of the government and was held responsible for the heavy taxation and other abuses of which the nation complained. In the midst of the conflicts of contending factions and after several impeachments and executions Richard in 1389 declared himself of age and took the government into his own hands. For several years the country enjoyed peace and a fair degree of prosperity until the king became involved in quarrels with the earls of Warwick, Arundel and others. Warwick was banished and Arundel beheaded, but Richard, after having triumphed over his enemies, began to quarrel with his friends. A misunderstanding having arisen between the duke of Norfolk and Henry, duke of Lancaster, Richard sent the former into banishment for life and the latter for ten years. But on Richard's return from an expedition into Ireland in 1399 he found that Lancaster had landed in England and raised a large army during his absence, with which he was marching to London; moreover, the army which Richard had taken into Ireland no sooner landed in England than it almost entirely deserted him and passed over to the invader. Richard met Lancaster at Flint Castle, where he formally resigned his crown and was carried captive to London and placed in the Tower. A month later Lancaster was proclaimed king as Henry IV, and Richard was condemned to imprisonment for life. In the following February Richard's body, or what was supposed to be his body, was brought from Pontefract Castle and shown to the public. According to some accounts, he was murdered in the castle in February, 1400; according to others, he escaped to Scotland and died there a lunatic.

Richard III of England, was the youngest son of Richard, Duke of York, and the great-grandson of Edmund, Duke of York, the fifth son of Edward III. He was born at Fotheringay, Oct. 2, 1452. On the defeat and death of their father in 1460, he and his brother George, afterwards duke of Clarence, were sent by their mother to Utrecht, where they remained until the crown was won from Henry VI by Edward IV, their older brother. In 1471 Richard led the van of his brother's army at Barnet, and took an active part in the decisive victory at Tewkesbury. It is claimed that after the battle he and Clarence murdered Prince Edward, son of Henry VI, and in some quarters it is believed that he was concerned in the murder of Henry himself in the Tower. Edward IV died on April 9, 1483, leaving Richard guardian of his son, Edward V, only 13 years of age; but, instead of faithfully fulfilling this trust, Richard placed the boy and his younger brother in the Tower and had himself proclaimed king. Not content with thus depriving young Edward of his crown, Richard caused him and his brother to be murdered while they were in the Tower, hoping thereby to make his own power the more secure. But Richard's numerous crimes made him so unpopular, that when Henry Tudor, Earl of Richmond, arrived in England with an invading force in 1485, he soon raised such an army that at the battle of Bosworth Richard lost both his crown and his life (August 22), and was succeeded by his antagonist as Henry VII.

Rich'ardson, Samuel, a famous English novelist, was born in Derbyshire in 1689, and died at London, July 4, 1761. He says of himself that he had only "common-school learning," and at 16 he was bound to a printer, with whom he served the usual period of apprenticeship. After working as a journeyman-printer for years, in 1719 he set up an establishment of his own, in which he attained a fair degree of prosperity. In November, 1740, when Richardson was over 50, he published his first novel: *Pamela or Virtue Rewarded.* So popular was this book that a second edition was published in February following, a third in March and a fourth in May. Eight years later appeared the work which is generally considered Richardson's masterpiece: *The History of Clarissa Harlowe.* Dr. Johnson declared this book to be the first in the world for its knowledge of the human heart; and Fielding says of it: "Such simplicity, such manners, such deep penetration into nature, such power to raise and alarm the passions, few writers, either ancient or modern, have been possessed of." Having drawn the ideal woman in Clarissa, Richarson proceeded a few years afterward to portray in Sir Charles Grandison the perfect man, "the man of true honor." *The History of Sir Charles Grandison* is considered a work of great ability, but not equal to *Clarissa*. Perhaps the most striking proof of Richardson's native genius is found in the facts that his method of telling a story by correspondence and his extreme diffuseness, either of which would be fatal to most writers, seem to give him only a firmer hold upon his readers and to increase and intensify the reality of his creations. See the essay of Mrs. Oliphant (*Blackwood's Magazine*, March, 1869).

Richelieu (*rēsh'lyē*), **Armand Jean du Plessis,** Cardinal Duc de, was born at Paris, Sept. 5, 1585, and was educated for the military profession at the Collège de Navarre. In 1607 he was consecrated bishop of Luçon, and for some time devoted himself to the duties of his diocese; but, when a rupture occurred between King Louis XIII and the queen-mother some years later, Richelieu was very active in securing a reconciliation between them, thereby laying the foundation of the great influence he afterwards exercised. In 1622 Richelieu was made cardinal, and in 1624 became minister of state, a position which, in spite of all opposition, he held until the end of his life. At one time the king had determined on dismissing him, but in an interview Richelieu so worked upon the weakness and fear of the monarch, that his supremacy was fully established from that day. Several important results attended Richelieu's administration of French affairs. The most important was the establishment of the absolute authority of the king, which during the feudal period was much abridged by the power of the nobility. By vigorous and often cruel and unscrupulous measures Richelieu broke down all the great nobles who opposed him, some of whom he brought to the scaffold, and sentenced others to lifelong imprisonment. When he died, there was scarcely any check upon the exercise of the king's prerogative. Another of his great enterprises was the overthrow of the Huguenot party as a political power, which he completely effected by the siege and capture of Rochelle in 1628. At the same time he secured for the Huguenots a measure of toleration, and, on the whole, he used his success in this conflict with great moderation. In his foreign policy, the chief object of which was to humble the power of Austria, he was equally successful. With this great end in view he allied himself with the German Protestants and even with the great champion of the Protestant cause, Gustavus Adolphus of Sweden He died at Paris, while at the height of his power and authority, Dec. 4, 1642. See *Le Cardinal Richelieu* by Dussieux.

Rich'mond, Ind., a city on the east fork of Whitewater River, 70 miles by rail from Cincinnati and about the same distance from Indianapolis. It was founded by the Society of Friends, who established Earlham College (coeducational) here in 1859. The public-school system is excellent. The city manufactures agricultural implements, pianos and automobiles. Population, 30,000.

Richmond, Va., capital of Virginia and county seat of Henrico County, is situated on the left bank of James River, about 150 miles from its mouth and 115 from Washington. The James supplies immense water-power; and the city contains nearly 1,000 manufacturing establishments, with a capital amounting to many million dollars. The chief of these are tobacco-factories, rolling-mills, iron-foundries, wagon and carriage works, lumber-mills and a railroad-car factory. In 1861 Richmond was selected as the capital of the southern Confederacy, and throughout the war was the objective point for all the aggressive movements of the eastern army of the Union, until the seizure of its lines of supply by General Grant compelled evacuation by General Lee on the night of April 2, 1865. A portion of the city was burned by the retreating Confederates; but the city has more than recovered her former beauty and prosperity. Her capitol was built after a model procured by Jefferson when in France, which was patterned after an ancient Roman temple. In its rotunda is a marble statue of Washington, taken from life. The city has an admirable public-school system and institutions of learning among them Virginia Mechanics' Institute, Richmond Female Seminary (P. E.), Hartshorn Memorial College (Baptist) for colored girls, St. Peter's Academy and Visitation Academy (R C), the Medical College of Virginia and University College of Medicine. Richmond has five public libraries, numerous beautiful churches, charitable institutions and hospitals. Population 200,000.

Richmond, Leigh, English clergyman, author of *The Dairyman's Daughter*, was born at Liverpool, Jan. 29, 1772, and while a child was lamed for life by leaping from a wall. He studied at Trinity College, Cambridge, and after filling the joint curacies of Brading and Yaverland in the Isle of Wight for a number of years, in 1805 he was appointed to the rectory of Turvey, Bedfordshire, where he died on May 8, 1827. Besides *The Dairyman's Daughter* he wrote *The Negro Servant* and *The Young Cottager*. The three tracts have carried his name over the civilized world. Collected, they form *The Annals of the Poor*.

Richter (*rĭk'tẽr*), **Jean Paul Friedrich** (usually known by his pseudonym of Jean Paul), was born on March 21, 1763, at Wunsiedel in northern Bavaria, and, after attending school in Hof for a number of years, was sent to Leipsic to study theology. But Rousseau, Voltaire and other authors had much greater attractions than did theology, and he, too, resolved to write books. His first literary efforts were satires, but he could get no publisher, and for years he carried on a desperate struggle against poverty, continuing to read and study with actual hunger as his daily companion. In 1785 he left Leipsic to avoid imprisonment for debt, and took refuge with his widowed mother at Hof. Here his circumstances were made a little easier, and he spent a number of years as private tutor in wealthy families. For a long time Richter seemed destined to failure as a writer, but in 1793 there was a turning point in his fortune, *The Invisible Lodge* proving unexpectedly successful. It was followed by other works which brought him a liberal pecuniary reward and gave him high rank among the literary men of his age. In 1801 Richter married and settled at Baireuth, where he spent the remainder of his days. The principal works written during his married life were *Titan* and *Wild Oats*, the former accounted by himself and most German critics his masterpiece. Jean Paul perhaps is the most unique character in German literature, the chief of humorists and, in the language of Carlyle, "a colossal spirit, a lofty and original thinker, a genuine poet [in prose], a high-minded, true and most amiable man." He died at Baireuth, Nov. 14, 1825. See *Life of Jean Paul F. Richter* by De Quincey.

Rick'etts, James B., an American general, was born at New York in 1816, and graduated at West Point in 1839 He served in various kinds of frontier duty and in the Mexican War until the Civil War broke out, in 1861, when he was made brigadier-general of volunteers, and continued in active service with the army of the Potomac until the close of the struggle. Among the battles in which he participated were Bull Run, South Mountain, Antietam, the Wilderness and the siege of Petersburg. He retired with the rank of major-general, Jan. 3, 1867, and died at Washington, D. C , Sept. 22, 1887.

Rid'dles may be defined as questions or propositions containing a more or less hidden meaning, which is to be discovered by guessing. At the present day propounding and solving riddles are a mere pastime, but in ancient times they were put to more important purposes, being used to some extent for practical instruction and intellectual discipline. Every reader of the Old Testament is familiar with the riddles which Samson proposed to the Philistines. They first came into use in Greece about the time of the Seven Wise Men, one of whom was celebrated for the composition of metrical riddles. The riddle was much cultivated in Europe during the middle ages, although it was an amusement rather than an intellectual exercise. Abbé Cotin published a collection of his own riddles and those of his contemporaries, in which he styled himself *Le Père de l' Enigme* (the father of the riddle), but his claim has not been recognized.

Rid'ley College is an Anglican church school for boys near St. Catherines, Ontario. It was founded in 1889 by men, under the presidency of the late Thomas R. Merritt, who wished to have a place where their boys might be educated on the lines of the famous English public schools. There are two schools, the upper one for grown boys and the lower one for children. Each has an independent headmaster and independent staff. The buildings accommodate 140 boys; and the school is so popular that applications for entrance have to be made some time in advance. Principal J. O. Miller, D. D., has been in charge since inception. Ridley was the first large residential school to establish entirely separate buildings, grounds and staff for junior boys.

Ridley, Nicholas, Protestant martyr, was born at Wilmontswick, Northumberland, about 1500, and, after graduating at Pembroke Hall, Cambridge, in 1522, was ordained priest in 1524. He next went to Paris and to Louvain, and, having met some of the most active reformers while abroad, after a three years' absence he returned to England an ardent believer in the doctrines of the Reformation, quickly making himself one of the foremost leaders of the church. In 1547 he was made bishop of Rochester, and, when Bonner was deposed from his position as bishop of London, Ridley was appointed his successor. He assisted Cranmer in the preparation of the 41 articles, afterward reduced to 39. After the death of Edward VI Ridley espoused the cause of Lady Jane Grey, ever going so far as to preach a sermon in which he declared both Mary and Elizabeth illegitimate. For this offense he was stripped of his office and dignities and committed to the Tower. In March, 1554, he was taken to Oxford to be tried by a commission, named by Cardinal Pole, for heresy, and, after being kept in prison for 18 months and resisting all influences to make him recant his views, he was burned at the stake in front of Balliol College on Oct. 16, 1555. See *Life* by Dr. Gloucester Ridley.

Riel, Louis, was the leading figure of the Red River Rebellion (*q. v.*). His father was white, his mother a half-breed. He had been educated for the priesthood in Montreal. Eloquent, magnetic, vain, he resisted the rule of the Dominion. Archbishop Taché was in Rome at the time. Riel seized Fort Garry and set up a provisional government. This caused the expedition under Sir Garnet Wolseley. As the expedition approached, Riel fled and found a refuge in the United States. Subsequently he was tried for treason, convicted, and executed in 1885.

Rienzi (*rē-ĕn'zē*), **Niccolo Gabrini di,** generally called Cola di Rienzi, was born at Rome in 1313. His advantages of education were excellent, and nature had bestowed a marvelous gift of eloquence. The assassination of his younger brother by a Roman noble whom he found it impossible to bring to punishment aroused his feelings against the aristocratic families, and he determined, if possible, to destroy their power and overthrow them. In 1343, in company with Petrarch and others, he visited the papal court at Avignon to induce Clement VI to return to Rome and protect the citizens from their oppressors. Rienzi returned in 1344, and for three years loudly and openly threatened the nobles with revolution. At last he summoned the citizens, and, surrounded by the pope's legate and a number of trusted confederates and followed by 100 horsemen, he proceeded to the capitol, where he assumed the title of tribune and was invested with complete dictatorial power. The pope confirmed Rienzi in his authority; all Italy rejoiced in his success; and many predicted a revival of the power and majesty of the Eternal City. But the nobles were bitterly hostile; and, although Rienzi won a great victory over them when they attempted to rise against him, the pomp and luxury which he sought to maintain involved him in such expense that he was compelled to levy heavy taxes. These aroused so much opposition that, after a reign of seven months, he fled to Naples. After two years among the Franciscans in the Apennines, he went to Prague to secure the support of Emperor Charles IV in another effort to deliver Rome. Charles, however, was so amazed at his schemes that he sent him a prisoner to the pope at Avignon, but by the mediation of Petrarch he was released. Innocent VI resolved to use Rienzi as a means of crushing the Roman nobles, and accordingly sent him to Rome in the train of Cardinal Albornoz. Their object was speedily accomplished, and Rienzi, having borrowed money and raised a body of soldiers, made a triumphal entry into Rome and was received with universal acclamation. But adversity had soured Rienzi's temper without teaching wisdom and moderation. The same defects that had characterized his former administration revealed themselves. In two months the opposition became so great that he was assassinated at the foot of the capitol stairs, his head being cut off and his body subjected to the greatest indignities (Oct. 8, 1354). His story has been made the basis of a thrilling romance by Bulwer. See the histories of mediæval Rome by Gregorovius, Reumont and Villari.

Ri'fles were invented for securing more accurate firing of bullets than was possible with the smoothbore gun. As the ball never fitted tightly in the smoothbore, it was, in its irregular motion along the barrel, pressed now against one side and now against the other, and therefore its direction after discharge was not determined by the line of the barrel, but by the particular point of the muzzle with which it happened to be in contact at the instant of discharge. The spiral groove, when the bullet fits into the grooves, causes the bullet to revolve on its axis with a rapidity in proportion to the force of the explosion and the sharpness of the twist in the spiral. During the War of 1812 the American army demonstrated the value of rifles in war; but many years were to elapse before they were generally placed in the hands of soldiers.

In 1837 a rifle invented by Captain Delvigne was issued to a few regiments in the French army, and four years afterward the Prussians equipped their entire army with the celebrated needle-gun, which proved its superiority over all rifles previously invented. The next step in advance was the rifle invented in 1849 by Captain Minie of the French army, in which the spherical bullet was discarded and its place supplied by one in the form of a cylinder with a conical point. Notwithstanding all the advantages of the minie gun, it was found too heavy for effective service; and in 1853 the British Enfield rifle was invented, in which, besides other improvements, the diameter of the bore was reduced about an eighth of an inch. This diminished the weight of the gun very materially without impairing its force or accuracy. In 1855 the United States adopted what was known as the Springfield rifle, of which the caliber was .58 inches, the bullet, which was cylindro-conical in form, weighing 500 grains and the powder-charge 60 grains. During the Civil War it became necessary to issue Enfield and other rifles to the regiments, but the Springfield, with its various improvements, continued to be the standard arm of the United States. The magazine-rifle is a rifle that stores the cartridges in the stock or above the trigger, and automatically feeds them into the breech. Pulling the trigger operates the magazine so long as the supply lasts. The bullet has great penetrating power.

Owing to the accuracy and deadliness of modern rifles and field pieces soldiers stand farther apart in warfare than formerly. The battles in the European War were distinguished by lines a hundred miles or more in length—truly a "far-flung battle line." This is due not only to the large number of men engaged but because owing to the range and accuracy of the weapons and the velocity of the projectile the men must be more widely distributed. This was one of the lessons of the Russo-Japanese War (*q. v.*). At Yalu 40,000 men were drawn out in a line five miles long—exactly the same front occupied by 180,000 Germans at Gravelotte in the Franco-German War (*q. v.*).

German rifles throw a bullet forward at the rate of 2,952 feet—more than half a mile—a second and in that respect excell any military rifle in the world. The French rifle has a longer range by a quarter of a mile.

As the Americans were the first to demonstrate the value of rifles in war so it is curious to note that in the European War the method of fighting went back to pioneer days in America—every bush, tree, stone, mound or hillock being used as a shield. Where the ground was level, and time, when permitted, artificial protection was made by digging trenches. Trenches developed into underground homes—reminding one of the days of the cave dwellers. These proved far more effective than fortifications (*q. v.*) of stone such as the magnificent ones at Antwerp which fell so quickly before the guns of the Germans.

As a result of the wider distribution of men and these methods of protection astonishingly few men were killed in the European War in proportion to the shots fired, as compared with previous wars. The conditions, however, put a much severer strain on the soldiers as it is much harder on the nerves to hide and be shot at than to fight in the open field or in hand to hand conflicts, such as those that took place when Xerxes invaded Greece or when Hannibal crossed the Alps. Nowadays a man is more apt to be killed by a man whom he has never seen—a feature of modern warfare which emphasizes the pity of it as expressed so eloquently by Herr Teufelsdrockh in the famous passage in Carlyle's *Sartor Resartus* about good, kind-hearted men who have no quarrel of their own being drawn up to "blow the souls out of one another" to adjust a boundary line.

Those little, crooked lines on our maps that define the boundaries of the world have—so many of them—been made in just that way. See *Treatise on Small Arms and Ammunition* by Lieutenant-Colonel Bond, R. A. Andrew Lang's *Homer and His Age*, tells many curious things about the armor of the ancient Greeks, and—you may be sure—tells it in a most interesting way. See ARMS.

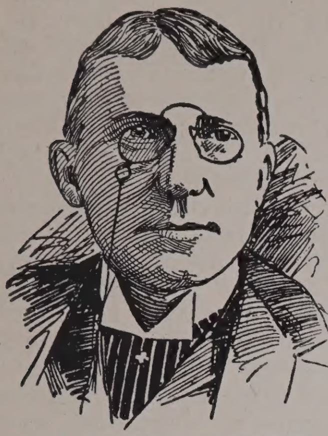
Riga (*rē'gȧ*), capital of Livonia and the third seaport of Russia, lies on Dwina River, seven miles from its mouth and 350 miles from Petrograd. The old town has narrow streets and medieval houses and stores; but the suburbs are laid out in broad streets with handsome buildings. Manufactures are numerous and varied and employ several thousand people. Riga was founded in 1201 by Albert, bishop of Livonia, and soon became a first-rate commercial town and a member of the Hanseatic League. It belonged to Poland from 1561 till it was taken by Gustavus Adolphus in 1621, and in 1710 it was finally annexed to Russia. Population 318,400.

Riggs, Kate Douglas (Wiggin), American author, was born in Philadelphia, Sept. 28, 1857. She graduated from Abbott Academy at Andover, Mass., and made her home in California, where she was the first to organize free kindergartens. She came into prominence as the author of *The Birds' Christmas Carol*, and her reputation as a writer of clever and well-told tales has never waned. Among her best-known stories are *The Story of Patsy, A Cathedral Courtship, The Diary of a Goose-Girl* and *Rebecca of Sunny-Brook Farm.* In 1895 she became the wife of G. C. Riggs, but still retains her maiden name of Wiggin as her pen-name.

Rigoletto, an opera in three acts. Words by Piave. Music by Giuseppe Verdi (1813-1901). The libretto is adapted from a drama of Victor Hugo's, and appeared first under the title *La Maledizione.* It possessed the necessary elements of interest for the hearer, and was so well-treated musically by Verdi as to give him world-wide fame. The first production of the opera occurred at Venice, March 11, 1851. It was not allowed on the stage, however, until such alterations had been made in the story as satisfied the government, who sanctioned the revision under its present title of *Rigoletto.*

Riis (*rēs*), **Jacob Augustus,** reporter, reformer, journalist and author, was born at Ribe, Denmark, in 1849. Having completed his course at Ribe Latin School, he came to the United States in 1870 and settled in New York City. After a few years of varied experience he became editor of *The South Brooklyn News*, which he afterwards bought and for a time managed. In 1877 he became a police-reporter for *The New York Tribune*, subsequently for *The New York Sun.* He soon became prominent in tenement-house and school reforms in lower New York City, and was active in the movement that led to the establishment of small parks in that section. In 1896 he was made executive officer of the Good-Government Clubs, and secretary of the New York Small-Parks Commission in 1897. He was frequently heard on the lecture-platform, contributed extensively to magazines, and is the author of a number of well-known and widely read books, of which the following is a list: *How the Other Half Lives* (result of study of the poor), *The Children of the Poor, Nibsy's Christmas, Is there a Santa Claus? Children of the Tenements, Out of Mulberry Street, Ten Years' War, The Making of an American, The Battle of the Slum* (a sequel to *How the Other Half Lives*), *The Peril and the Preservation of the Home, Theodore Roosevelt the Citizen* and *The Making of an American* (autobiography). He died in 1914.

Ri'ley, James Whitcomb, American author, familiarly known as the Hoosier poet, was born at Greenfield, Ind., in 1853. After a desultory education he began contributing verse of a dialect character to the newspapers, not a little of which, though simple and at times prosaic, is tender and touching. The success of his work led to reciting his poems in public, chiefly those in the Hoosier dialect, caught and utilized as a remembrance of his early life on a farm He died July 22, 1916. Among his best-known productions are *The Old Swimmin' Hole, Green Fields and Running Brooks, Old Fashioned Roses, A Child-World, Pipes o' Pan at Zekesbury, An Old Sweetheart of Mine, Rubaiyat of Doc Sifers, The Book of Joyous Children, Songs o' Cheer* and *While the Heart Beats Young.*

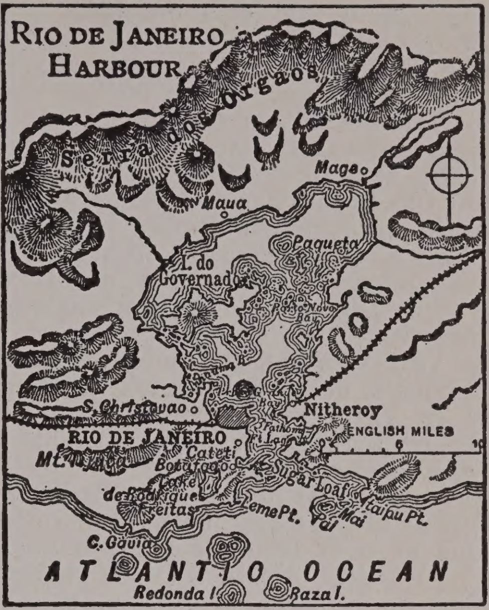


J. WHITCOMB RILEY

Rimini (*rē'mē-nē*), a city of Italy, on the shore of the Adriatic, 70 miles from Bologna; it is still surrounded by walls, and contains many mediæval buildings. The spot where Cæsar stood to address his soldiers, after crossing the Rubicon (about ten miles northwest of Rimini), is marked on one of the squares by a monumental pillar, and beside one of the gates stands the triumphal arch, 46 feet high, erected in honor of Augustus. Population 43,590.

Rine'hart, William H., an American sculptor, was born in Frederick County, Md., Sept. 13, 1825. He received only a common-school education, and at 21 apprenticed himself to a marble-worker in Baltimore. So great was his interest in his trade and so close his attention to his duties, that in two years he was put at the head of the ornamental work. In 1855 he went to Italy with the determination to be a sculptor, and after two years' instruction and practice in Florence he brought back two bas-reliefs of such unquestioned merit, that no critic could fail to recognize his artistic talent. After remaining in Baltimore about a year, he went to Rome, where he continued until his death, his orders for portrait-busts becoming so numerous that he generally had one or two years' work ahead. A bronze statue of the late Chief Justice Taney, made by Rinehart under a commission from Maryland, was unveiled in Annapolis in 1872. Among his greatest works are the *Angel of the Resurrection, Woman of Samaria* and *Clytie.* This was on exhibition in Peabody Institute of Baltimore. He died at Rome, Oct. 28, 1874, leaving $45,000 as a fund for the aid of indigent students of art.

Rio de Jane'iro (*rē'ō dā zhā-nā'rō*), capital of Brazil, stands on the western side of one of the finest natural harbors in the world. The city and its suburbs stretch nearly ten miles along the shore, while great mountain-ranges shut in the background. About three miles southwest stands the precipitous cone of Corcovado, up which a cog-railway carries 100,000 visitors every year to enjoy the magnificent view of land and sea. The city is the commercial as well as political capital of Brazil, sending more than half of its exports and bringing in 45 per cent. of the imports. The exports of Brazil in 1910 amounted to £75,465,109, the greater portion of this amount being derived from coffee. Manganese ores are largely exported from Bahia and Rio de Janeiro. At Rio, besides large flour-mills, there are important woolen factories of cloths, felts, flannels and rugs. In January of 1531 Alphonso de Sousa, a Portuguese captain, entered the bay, and, thinking it the mouth of a large river, named it Rio de Janerio—that is, January River; but the city was not founded until 1536. Its population, including many foreigners, is about 1,000,000. The state of Rio de Janeiro has an area of 26,634 square miles, and population of 926,035. Rio de Janeiro is represented in the Brazilian Congress (chamber of deputies) by 17 deputies. In 1903-04 military interference in the states of the republic led to a naval revolt in the Bay of Rio de Janeiro, which was suppressed later. See BRAZIL.



Rio Gran'de, a large river of North America, rises in San Juan Mountains in Colorado and flows southeastward, forming the boundary between Texas and Mexico, its length being about 1,800 miles. For the most part it is a shallow stream, but steamboats can ascend it for nearly 500 miles. Its chief tributary is the Rio Pecos.

Rio Negro (*rē'ō nā'grō*), one of the principal affluents of the Amazon, rises as the Guiana in southeastern Colombia, and flows east into Venezuela, south into Amazonas in Brazil and again east and southeast until it joins the Amazon at Manaos, after a course estimated at 1,350 miles. It is over a mile broad when its clean, inky-black stream enters the yellow, muddy Amazon.

Rip'ley, George, was born at Greenfield, Mass., Oct. 3, 1802. After graduating at Harvard College in 1823, he studied theology there and was ordained to the pastorate of a Unitarian church at Boston. This he held until 1841. In the meantime he had become one of the leading spirits in the Transcendental movement, the first meeting of the club being held at his house in 1836; and on leaving the pulpit he started the Brook Farm experiment. This ended in 1847, when Ripley removed to New York City and engaged in literary and journalistic work. He died on July 4, 1880. See *Life* by O. B. Frothingham in the American Men of Letters Series.

Rip Van Win'kle, the hero of Washington Irving's delightful sketch, first published in 1820, is an idle, good-natured, henpecked scapegrace, who, with his gun and dog, seeks a refuge from the scolding of his sorely tried and ill-tempered wife in the forests of the Catskill Mountains. There he falls in with Hendrik Hudson and his crew of *The Half-Moon*, who are playing at ninepins in a secluded hollow, the balls sounding like peals of thunder along the sides of the mountain. Rip is directed to wait on them, and while in this service drinks of their liquor until his senses forsake him and he falls asleep. He wakens on a bright summer morning 20 years afterward, to find his dog gone and a rusty firelock by his side. When he returns to his native village, he sees new buildings and new faces on the street. His own house has fallen into decay; his wife is dead; and he who went away a subject of George III has returned to find himself a citizen of the United States. This story has been dramatized, but no version has held the stage except the one with which the name of Joseph Jefferson has been identified.

Ristori (*rēs-tō'rē*), **Adelaide,** an Italian tragedian, was born on Jan. 29, 1821, at Cividale in Friuli. Her parents were strolling players, so that she may almost be said to have begun life in the theater. At 14 she took a part in *Francesca da Rimini*, and in a few years became the leading actress of Italy. After acting in her own country for years, she presented herself before a French audience in 1855 and won a complete triumph, and thereafter gained additional laurels in nearly every country in Europe, as also in the United States and South America. The *rôles* in which she especially shone were Mary Stuart, Media, Marie Antoinette and Lady Macbeth. She retired in 1885, and died on Oct. 9, 1906.

Ritschl, Albrecht, a German Protestant theologian, was born at Berlin, March 25, 1822, and died at Göttingen, March 20, 1889. Studying at Bonn and Halle, he became professor of theology at the former, but subsequently accepted the same chair at Göttingen, where he became a well-known exegete and the head of a school of theology bearing his name. Though he held that Christianity is a divine revelation, he held free views regarding inspiration, and was no believer in the supernatural. He rejected the doctrines of the trinity, incarnation, original sin and other orthodox religious beliefs, holding that the religious sense is the essential and ultimate fact in religion. Only a few of his published works are translated from the German. Of his works the chief are *The Christian Doctrine of Justification and Reconciliation*, *Theology and Metaphysics*, *History of Pietism*, *Instruction in Christian Religion* and *Origin of the Ancient Catholic Church*.

Rit'ter, Karl, an illustrious geographer, was born at Quedlinburg in Prussia, Aug. 7, 1779. After studying at Halle, he was nominated professor of geography at Berlin in 1820, and afterwards became member of the academy and director of studies of the military school. With Ritter as the founder of comparative geography began a new epoch in the history of geographical science. His chief work, *Geography in Its Relation to Nature and the History of Men*, was divided into (1) Central Asia, Siberia, China and India; (2) Western Asia; (3) Arabia; and (4) Sinai, Palestine and Syria. His lectures were published in *History of Geography; General Geography;* and *Europe*. He died at Berlin, Sept. 28, 1859, and his name is perpetuated in two geographical institutions at Berlin and Leipsic.

Riv'erside, Cal. city and county-seat of Riverside County, about 60 miles east of Los Angeles. The climate makes it especially attractive as a health-resort. The mission-style of architecture is used extensively in the public buildings. Noteworthy buildings in this style are the high school, Carnegie Library and Glenwood Hotel. The irrigation-system is one of the most extensive in southern California, and the yearly crop of citrus-fruit grown in the county fills more than 8,000 cars. There are nearly 40 packing-houses employing over 1,500 persons. Riverside is the seat of Sherman Institute, a United States Indian school, which has 600 pupils. Population 24,000.

Rives (*rēvz*), **Amelia** (known also as Mrs. J. Armstrong Chanler and as Princess Amélie Troubetzkoy), American novelist, was born at Richmond, Va., Aug. 23, 1863. Her earliest production was a series of stories entitled *A Brother to Dragons*, which showed imagination and a certain strength. This was followed by a sensational and passionate work called *The Quick and the Dead*, which met, however, with considerable popularity. Her later work embraces *Virginia of Virginia*, *Herod and Mariamne, According to St. John, Barbara Dering, Athelwold, Tanis* and a number of magazine articles. In 1896, after being divorced from J. A. Chanler, her first husband, she married a Russian prince.

Riviera (*rē′vē̇-ā′rȧ*), ("seashore"), the narrow strip of coastland bordering the Gulf of Genoa. West of Genoa it is called Riviera di Ponente or the western coast and beyond Genoa Riviera di Levante or the eastern coast. The western section is the more frequented section, as it abounds in the most striking and beautiful scenery and has numerous health and fashion resorts.

Roads. Great roads must have been built by all ancient nations; but the oldest roads of which parts still remain are those of the Romans, who built them of huge, deep, stone blocks and concrete. The modern plan of broken-stone roads is, however, far superior. It takes its name from the Scottish engineer Macadam (*q. v.*). At the same time with Macadam (about the beginning of the 19th century) Telford, another Scottish engineer, adopted a similar plan; but used a base of stone set on edge, which is unnecessary, and had been long used in France. In macadamized roads a foundation of stone-blocks about six inches deep is surmounted by broken stone and covered with a thin layer of clay or other building material. Owing to the greater distances to be traversed, roads in the United States are very backward as compared with those of Europe. Roads at first were chiefly in the hands of turnpike companies who charged toll to passengers; but they are now locally constructed by the states and townships, a rate being levied on the property-holders who obtain the chief benefit. The repairing of roads is a source of great expense; it is best done by constant work of gangs of road-repairers who patch roads wherever needed. Each road has to be constructed with reference to shortness, ease of grade, hard and smooth surface and thorough drainage. The introduction of automobiles has created a loud call for "good roads" and increased attention is now given to road-improvement.

Roanoke (*rō′á-nōk′*), a river of Virginia and North Carolina, formed by the junction of the Dan and Staunton Rivers, a mile above Clarksville, Va., flows southeast through North Carolina and empties into Albemarle Sound. Its length is a little over 200 miles, and it is navigable for steamboats from its mouth to Weldon, a distance of 130 miles.

Roanoke, Va., a city on Roanoke River, 257 miles west of Norfolk, at the junction of the Shenandoah-Valley division and the main line of the Norfolk and Western Railway. In 1881 it contained only 600 inhabitants, while the population is now in excess of 60,000, making it the third city in size in the state. The Norfolk and Western general offices and immense repair-shops are here, as well as extensive bridge-works, iron-furnaces and other manufacturing establishments. It also is a distributing point for wholesale houses of various descriptions, and is the gateway to the great coal-fields and timber-districts of Virginia and West Virginia. It is the junction-point for several divisions of the Norfolk and Western Railway, and is the only city of importance which is touched by the new Virginian railway, extending from Kanawha River to Chesapeake Bay.

Robbia, Luca della (*lo͞o′kä dĕl′yä rŏb′bēä*) born in Florence about 1400, was the first and greatest of the Robbias who flourished in Italy for nearly a century. Luca is most popularly known as the inventor of enamelled, colored terra-cotta rather than as a great sculptor only slightly inferior to Donatello and Ghiberti. The glazing of terra-cotta was an ancient art and had never fallen into disuse; but, while its use in architectural decoration was old, Luca was the first to apply it to sculpture in independent monumental form. It probably was his desire for color which prompted his investigations; and he was successful in finding a coating by which color was made durable as stone. Luca strove to obtain the effect of old polished marble or ivory; and it is said that for many years the secret of the process and immense technical knowledge and skill were closely kept in the Robbia family, and handed down as a legacy from generation to generation. Luca's work may be distinguished not only by its conception but by the soft creamy white of the figures, even opaque but luminous blue of his backgrounds and the careful fitting together of the sections. Luca's private life was uneventful. He was trained by a goldsmith, but soon asserted his preference for working in bronze and marble. He was intensely devoted to art and seems to have had few other interests except that the *Cantoria* and other works show a great knowledge of and feeling for music. He never married, but devoted his later years to the education of his nephews, of whom Andrea was the favorite.

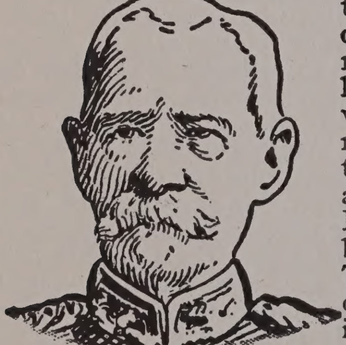
At 30 Florence gave him the order for the most important work, his masterpiece, the marble *Cantoria* or singing-gallery executed for *Santa Maria del Fiore*, the Cathedral of Florence. There are ten marble reliefs representing youths and children and symbolizing music. It is a triumph of poetic conception, composition, science and skill. His best relief in glazed terra cotta is his *Resurrection* designed to fill the tympanum of the door of the *Sagrestia Nuova* beneath his own *Cantoria*. Luca's famous bronze doors are as great as his greatest sculptures. They are massive and severe, and retain in the design the character of strength and resisting power belonging to the purpose of the doors. His madonnas are lovely conceptions, and he is probably best known and appreciated by the general public through these. He died in 1481 on the 20th of February.

Rob′ert I of Scotland (Robert the Bruce). See BRUCE, ROBERT.

Robert II of Scotland, 1371–90, was born on March 2, 1316, two years after the battle of Bannockburn. He lost both his parents in infancy, and throughout the disastrous reign of his uncle, David II, he was one of the most prominent nobles of Scotland, twice acting as regent during his exile and captivity. On David's death he obtained the crown, and became the founder of the Stuart dynasty. The wars which Robert waged with England were conducted by his barons, who shaped the policy of the kingdom according to their pleasure. The most noted features of Robert's reign were the invasions of Scotland by the duke of Lancaster ("old John of Gaunt") in 1384 and by Richard II in 1385 and the retaliatory expedition of the Scotch in 1388, which culminated in the battle of Otterburn. King Robert died in Ayrshire, April 19, 1390.

Robert III of Scotland, was born about 1340 and came to the throne on the death of his father, Robert II. His weakness and imbecility as ruler virtually placed the government in the hands of his brother, the Earl of Menteith. The chief events of Robert's reign were the invasion of Scotland by Henry IV of England in 1400 and the retaliatory expedition of Archibald Douglas, which resulted in the terrible disaster at Homildon Hill in Northumberland two years later. Robert died of grief on April 4. 1406, on learning that his son James had been taken prisoner by an English cruiser, while crossing the Channel on his way to France.

Roberts, Frederick Sleigh, Lord Roberts, Earl of Kandahar, Pretoria and Waterford. In 1852 a diminutive English boy of 20 in the brand-new uniform of a lieutenant and with the erect carriage acquired in the military school at Sandhurst, England, embarked for India. The typical soldier, he was born in camp at Cawnpore, Sept. 30, 1832, and was bred for war. He was immediately nicknamed Little Bobs by the officers of his mess in affectionate raillery. He had the toughness and nervous alertness of a terrier. Quiet, keen, cool, a shrewd observer and personally popular, big soldiers were ashamed not to follow where "Little Bobs" led. He learned Hindustani so as to deal personally with native chiefs; telegraphy to be independent of operators. He trained himself to remain in the saddle 100 miles or 36 hours at a stretch. He had the geographical instinct that is invaluable to a soldier — he never got lost in the darkest night or the roughest country. For the rest, he never fell sick in the worst pest-holes of India, he was personally brave and proverbially lucky.


LORD ROBERTS

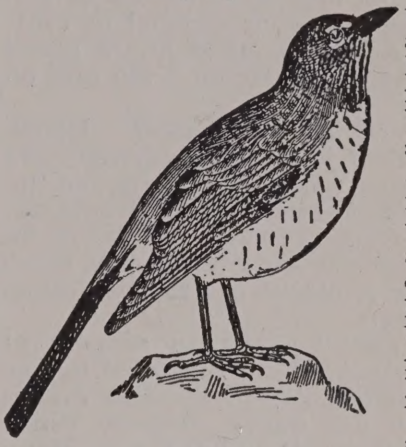
Employment for an officer so equipped was never lacking in India. Enlisted for ten years he remained forty-one. In '57, '67 and '78 there were wars — the Indian mutiny, the expedition into Abyssinia and the Afghan war. In each he distinguished himself and rose steadily in rank. In the siege of Delhi he was wounded, in the relief of Lucknow he won the Victoria Cross. The trouble in Afghanistan found him, at 40, a major-general and in command of the column that marched from Kabul to the relief of Kandahar. This march was made spectacular by the fact that the force was cut off from communication for a month, and lost to the world in the desert. "Little Bobs' " bump of locality brought his column through in safety. His generalship lifted the siege. He and his horse were decorated by Queen Victoria. As commander of the army of Burmah he remained in India until 1893. At 61 he was an earl, a member of the house of lords, and held the military rank of field-marshal. He retired to the honorary duties of commander of the army of Ireland, feeling that his active career was finished. He was in his 68th year when disasters to the army in South Africa in the Boer War of 1899 demanded his return to the front. It was in mourning that he went to Cape Town, for his only son and heir to his titles and estates had fallen at Colenso, after winning the Victoria Cross.

"Little Bobs is at the helm at last" was the cry of relief from all England. His grasp of the complicated situation was immediate and masterly, and his activity and energy shamed officers 20 years his junior. He inspected guns and stores and troopships, visited prison-camps and hospitals, laid out transport-lines and planned every detail of a campaign along a 1,000-mile front of hostilities. He quickly brought order out of chaos, posted every man to the best advantage, and led the main column of the army of invasion. The march to Pretoria may be compared, in its intention and results, with Sherman's march to the sea. He struck at Cronjé entrenched at Kimberly, captured Bloemfontein, capital of Orange Free State, compelled the Boers to abandon the siege of Ladysmith, divided and demoralized the forces of the enemy, ignored the guerilla chief — De Wet — and bluffed his way on scant rations into Pretoria and so turned defeat into victory. But for "Little Bobs" South Africa would probably have been lost and Great Britain's hold on all her colonies weakened. He returned to England to succeed Lord Wolseley as commander-in-chief of the army. He died of pneumonia, Nov. 14, 1914, while on a tour of inspection of the British forces in France. His life may be traced in his military autobiography: *Forty-One Years in India* and in Winston Churchill's *Story of the Boer War.*

Rob'ertson, Frederick William, a celebrated minister of the Church of England, was born at London, Feb. 3, 1816. He matriculated at Brasenose College, Oxford, in 1837, and while there ardently devoted himself to the study of the Scriptures and standard literary works. In 1847 Robertson was called to Trinity Chapel, Brighton, where in a ministry of six years he arrested the public attention by originality, beauty and freshness of thought, wide human sympathy, knowledge of the human heart and interest in everything pertaining to human welfare. He showed his friendship for the working-classes by establishing the Workingmen's Institute at Brighton and preaching to its members the duty of culture and self-control. During Robertson's last years he suffered from a disease of the brain, which was aggravated by the misrepresentations to which he was subject on account of his liberal theological views and his sympathy for the laboring-classes. He died at Brighton, Aug. 15, 1853. See the *Life and Letters* and *Sermons.*

Robespierre (*rō'bes-pēr'*), **Maximilien Marie Isidore,** was born at Arras, France, May 6, 1758. After pursuing a course of study at the college of his native town, he was sent to complete his education at the College of Louis le Grand at Paris. On the convocation of the states-general in 1789, he was elected one of the deputies and went to Versailles; and here observers noted a peculiar force and earnestness that gave promise of a distinguished career. "This man," said Mirabeau, "will go far, for he believes every word he says." After the death of Mirabeau Robespierre's importance seemed to increase, and from this time forward his biography is a history of the French Revolution. Robespierre was one of the deputies to the national convention, which was formed in 1792, and as chief of the extreme party, called The Mountain, he was one of the main agents in procuring the execution of the king, which took place in December of that year. In the following year occurred his final struggle with the Girondists, many of whom he sent to the scaffold during the Reign of Terror that lasted for many months. Marie Antoinette and the Duke of Orleans were the first victims; Danton, Camille and others followed; and under the so-called committee of public safety Paris became the scene of an indiscriminate slaughter, in which thousands of lives were sacrificed. "Robespierre will follow me; I drag down Robespierre" said Danton on the scaffold. The end of the tyrant — such was the name given to him — drew rapidly near. A conspiracy was organized against him, and after a fierce tumult in the convention he was arrested. Next day (July 28, 1794), in company with Couthon, Saint-Just and 19 others, he closed his career on the scaffold. See the histories of the Revolution by Lamartine and by Taine.

Rob'in, the commonest of the American thrushes, ranging in summer from Mexico to Labrador and Alaska In winter it is found from Virginia south. It is among the first migratory birds to arrive north of its winter limit. This bird is a near relative of the English blackbird. It is about ten inches long, with head and tail blackish and the rest of the upper parts olive-gray. The color of the under parts is chestnut-brown, except the throat, which is white with black streaks. The breast of the young robin is spotted. Its habits are too well-known to require description. The robin of England and Europe is an entirely different bird, belonging to the family of warblers. See REDBREAST.



ROBIN

Rob Roy, the popular name for Robert McGregor, a celebrated Scottish outlaw, whose singular adventures entitle him to be considered the Robin Hood of Scotland. Rob Roy borrowed money from the Duke of Montrose to engage in cattle speculation; but, as he met with heavy losses, his estates were seized by the duke on account of the debt. Being rendered desperate by his misfortunes, he collected a band of about 20 followers and made open war on the duke, robbing him of his cattle and preventing him from receiving the rents of his tenants. Many stories are still current in the neighborhood of Lochs Lomond and Katrine of his narrow escapes from capture by the troops that were sent after him. Many instances have also been recorded of his kindness and liberality to the poor, whose wants he often supplied at the expense of the rich. He died in his own house on Dec. 28, 1738, his funeral being attended by all the people of the district, except the partisans of the Duke of Montrose. Rob Roy's exploits have been immortalized in Scott's novel which bears his name.

Rochambeau (*rô′shăm-bō′*), **Jean Baptiste Donatien de Vimeure,** Comte de, a French marshal, was born at Vendome, July 1, 1725, and entered the army in 1742. In 1780 he was sent to America in command of 6,000 men to assist the colonies in their war for independence, and rendered effective assistance to Washington at the siege of Yorktown, the surrender of which by Cornwallis brought the war to a close. During the French Revolution he was imprisoned at the Terror (1798), and was saved from the scaffold only by the death of Robespierre. He became a marshal in 1791, and in 1804 Napoleon made him a grand officer of the Legion of Honor. He died on May 10, 1807.

Rochefort (*rōsh-fôr′*), **Victor Henri,** Comte de, French journalist, playright and Radical politician, was born at Paris, Jan. 30, 1830, a descendent of the old French nobility. He was noted for his repeated attacks in his newspapers upon men and governments, which again and again compelled him to quit France. He died in 1913.

Rochelle (*rô-shĕl′*). **La,** a seaport of France. Its harbor is still sheltered by the remains of Richelieu's famous dike and is surrounded by fine quays, close to which lie the principal streets and squares. Many of the latter are regular and well-built, and present a handsome appearance from the number of houses adorned with porticoes and balconies. Rochelle, which was known until the 12th century under its Latin name of *Rupella* or Little Rock, of which its present name is a mere translation, was settled by a colony of serfs of Lower Poitou, who, fleeing from the persecutions of their lord, settled on the rocky promontory between the ocean and the neighboring marshes. A stronghold of the Huguenots, it was unsuccessfully besieged in 1573, and in 1627–8 it offered 14 months' resistance to the forces sent against it by Cardinal Richelieu, but was at length compelled to surrender. To-day it is a fortress of France of the second class. Population 31,559.

Roch′ester, N. H., city in Strafford County, on Salmon Falls and Cocheco Rivers about 30 miles from Concord. Its chief manufacturing establishments are shoe-factories, woolen-mills, brick-works and box-factories, while it also has smaller factories. The city has public and parochial schools, private commercial schools, a public library, several churches, and Gaffney Home for the Aged. Rochester was settled and incorporated in 1722, and chartered as a city in 1891. Rochester has the service of four railroads, all controlled by the Boston and Maine Railroad. Population 8,868.

Roch′ester, N. Y., the third city in size and commercial importance in the Empire State, is located in the Genesee river-basin, seven miles from Lake Ontario. Its elevation above the lake ensures perfect drainage, which, with an inexhaustible water-supply, enables it to rank in healthfulness first among the cities of the state. It was settled in 1812; incorporated as a village in 1817 and created a city in 1834, and now contains 181,666 population. It contains 125 churches (67,000 communicants), four well-equipped hospitals, a municipal hospital (for contagious diseases), the insane asylum or state hospital, five orphan-asylums and a home for the friendless. It has 38 public schools, 18 parochial schools, three academies, Rochester Theological Seminary (Baptist), Saint Bernard's Theological Seminary (R. C.), Rochester University, Rochester Athenæum and Mechanics' Institute (a technical trade-school), a large deaf-mute school, private classical and preparatory institutions and one public library. Here is Western New York Industrial School, a state-reformatory, containing about 1,000 pupils of both sexes. Rochester's principal industries embrace the manufacture of shoes leather-products, clothing, flour, optical instruments, buttons, kodaks, photographic materials, sewer-pipe, cigars, tobacco, furniture, candy, canned goods, time-locks and typewriting machines. These industries have an invested capital of $52,000,000, and produce $300,000,000 worth of goods annually. The largest nurseries in the world are at Rochester, and the production of flowers and flower-seeds comprises an important industry. As a shipping-point the city has the advantages of nine railways, Erie Canal and a fine harbor on Lake Ontario — Port Genesee. The 19 surrounding townships comprising Monroe County are fertile and productive, having a valuation of $37,000,000. The city is noted for fine parks (666 acres), wide streets, beautiful drives and surrounding pleasure-resorts. Population 350,000.

Rock′efell′er, John Davidson, American capitalist and president of the Standard Oil Company, was born at Richford, N. Y., July 8, 1839, and at an early age removed with his parents to Cleveland, O., where he was educated in the public schools. His business career began in the office of a commission-merchant, and in the sixties, when he showed great aptitude for commerce, he engaged in the oil-business, which in its gigantic developments has yielded him an immense fortune. In the seventies and eighties various oil-operating firms were consolidated into the gigantic trust, known as the Standard Oil Company, of which Mr. Rockefeller became president. In 1912 the company was dissolved under the Anti-Trust laws into its original constituent companies and Mr. Rockefeller retired from official connection with the business. His gifts to education, religion and other benevolences have reached an aggregate of over $189,000,000.

To the University of Chicago he has given $34,000,000. To the General Education Board, an organization formed by John D. Rockefeller, Jr., and others and chartered by Congress, he gave $1,000,000 in 1903, $5,000,000 in 1905 and $32,000,000 in 1907; a total of $43,000,000. He endowed the Rockefeller Institution for Medical Research in New York City with $12,000,000, the Rockefeller Foundation with $100,000,000 and has given large sums to other institutions.

Rock'et. See FIREWORKS.

Rock'ford, Ill., a thriving city on both sides of Rock River, about 85 miles northwest of Chicago. It has five bridges, three of which are railroad bridges, five railroads, flouring, paper, five hosiery factories, five factories of agricultural implements, 30 of furniture, 24 for machinery and three for pianos; one piano-action establishment and the largest leather-factory in the United States, besides manufacturing cutlery, pumps, carriages, watches, silver-plated ware, boots, shoes, wire goods, photo-engravings and other products. The city is well-built, and is noted for the intelligence and enterprise of its citizens. Rockford College is one the best and oldest college for women in the country. Population, 75,000.

Rock'ing-Stones or **Logans** are large masses of rock so finely poised as to move backward and forward with the slightest impulse. Some rocking-stones occur near remains of ancient fortifications, which seems to confirm the statement, in one of the poems of Ossian, that the bards walked, as they sang, round the stone and made it move as an oracle of the fate of battle. In Greece rocking-stones occur as funeral monuments, and are generally found on conspicuous places near the sea. The rocking-stone of Tandil in the Argentine Republic, 250 miles south of Buenos Aires, weighs 700 tons, and yet is so nicely poised that it rocks in the wind and may be made to crack a walnut.

Rock Island, Ill., a city on the Mississippi, opposite Davenport, Ia. — the two towns being connected by a wrought-iron bridge which cost over $1,000,000 — is 180 miles from Chicago. The island in the Mississippi, from which the town is named, belongs to the United States government and is retained as an arsenal for the manufacture of soldiers' equipments, including small arms. Its area is about 1,000 acres; it is beautifully wooded and, with its winding drives, serves as a park for the citizens of Davenport, Moline and Rock Island. The channel south of the island has been dammed so as to furnish immense water-power for the arsenal's use, as also for private plants and public utilities. The city has saw-mills, besides foundries, machine-shops and factories which produce wagons buggies, plows and stoves. Population 45,000.

Rockland, Me., city and county-seat of Knox County, on an inlet of Penobscot Bay, 86 miles from Portland. Its harbor has natural protection against storms, except from the northeast, and against these by a breakwater. This was built by the federal government at a cost of $500,000. Among its important industries are the quarrying of granite, shipbuilding, the manufacture of lime, steam and gasoline engines, blacksmiths' and granite-workers' tools. Fishing is carried on to some extent; clams and sardines are canned; and more than 2,000,000 pounds of lobsters are shipped from here annually by rail. Rockland has the service of the Maine Central Railroad, and has steamboat connection with Portland, Boston, Bangor and all important coast and island towns of eastern Maine. It also is the center of an electrical railway system extending northward and westward, and the towns of this connected region attract many summer tourists. Population 8,174.

Rock River rises in the southeastern portion of Wisconsin, and flows south and southwest into Illinois, emptying into the Mississippi three miles below Rock Island. Its course of nearly 400 miles is through a region noted for beauty and fertility.

Rocks. See GEOLOGY.

Rock'y Mountains, a vast system of ranges in the western portion of the United States and the British possessions. They are a continuation of the Cordilleras of Mexico. The greatest breadth of this system in the United States is 1,000 miles, and their total area is nearly 1,000,000 square miles. From 32° N. to 40° N. the ranges bear nearly north and south; between 40° and 45° their course is northwest; then, after a more northerly bend, they keep a course nearly parallel with the Pacific, but have many detached ranges and peaks. Mt. St. Elias is 18,024 feet high, and marks the boundary line of longitude between Alaska and the British possessions. Mt. McKinley in Alaska is 20,464 feet and Mt. Wrangell (also in Alaska) 17,524 feet. Mount Shasta, in the coastal range in northern California, is 14,510 feet high; Mt. Whitney, also in California, 14,898 feet. Frémont's Peak, near the western boundary of Wyoming, is 13,576 feet high, and Mt. Rainier, in Washington, 14,444 feet. In British Columbia Mt. Brown rises 16,000 feet, Mt. Hooker 15,700 and Mt. Logan 19,500. The central range of the Rocky Mountains forms the ridge which divides the rivers falling into the Pacific from those falling into the Arctic Ocean, Hudson Bay and the Gulf of Mexico; but between the eastern and western ranges lie Utah and Nevada, in which are rivers having no outlets except such lakes as Great Salt Lake in Utah and Humboldt Lake in Nevada.

Rocky Mountain or **White Goat,** an American goat-antelope, as a rule is found in the mountains just above the timber-line, in high, inaccessible spots where only the boldest hunter can follow; but in British Columbia it comes toward the coast. In appearance clumsy, it is remarkably agile, an expert in climbing rocks and icy steeps. Its weight is about that of the common deer. In form it resembles the bison, the body thick-set, legs stocky, hind-quarters low, shoulders high, head carried low. The dense coat is all yellowish white, the hair next the skin fine, the outer hair long and coarse. The Indians used to make blankets of the long silky hair, and now the hides are valued. The horns are small, black, smooth and sharp-pointed, having little beauty to attract the trophy-hunter. It is found sparingly in Alaska and British Columbia, in Idaho, Montana and Washington, but the well-beaten trails tell of great numbers that once existed.

Ro'dents, or the order of *Rodentia*, form the largest order among mammals, and include upwards of 2,000 species. They range in size from the mouse to the South American capybara, which is almost as large as an ordinary hog. They are characterized chiefly by the nature of their teeth. They have no canine teeth; but have long, curved, very sharp incisors, which are separated from the molars by a considerable gap. The molars are few; and are moved sideways with the jaw in the characteristic gnawing of animals of the order. Among well-known rodents may be mentioned (besides the many familiar species of rats and mice) the beaver, hare, agouti, jerboa, guinea-pig, muskrat, mole-rat, rabbit, marmot, squirrel, woodchuck, porcupine, capybara and lemming. Rodents live almost absolutely upon vegetable food. They often are cunning and are guided by elaborate instincts, as in the case of the beaver. Some of them make great migrations, as, *e. g.*, the lemmings. The furs of some of the group are of value, and some are edible. The ordinary rats and mice, however, are pernicious and destructive; and it has recently been demonstrated that rats are chiefly responsible for the spread of the bubonic plague in India and elsewhere.

Rodg'ers, John, an American naval officer, was born in Maryland, Aug. 8, 1812, his father being the Capt. John Rodgers who distinguished himself by firing the first gun on the British during the War of 1812. He entered the navy in 1828, and was commissioned captain in 1862. Next year, while in command of the monitor *Weehawken*, he captured the Confederate *Atlanta*, and was promoted to be commodore. He became rear-admiral in 1869, and was superintendent of the United States Naval Observatory at Washington from 1877 until his death, May 5, 1882.

Rodin (*rō'dăn'*), **Auguste,** the most original of modern sculptors and by many ranked as the greatest of his time, was born in Paris in 1840. His best known conception, *The Thinker*, is one of the figures in a colossal group called "*The Portal of Hell.*" It represents primitive man contemplating the sufferings of the lost in *Dante's Inferno.* Other famous works are, *The Kiss*, *The Burghers of Calais*, *The Hand of God*, a monument of Victor Hugo and a statue of Balzac. He died November 17, 1917.

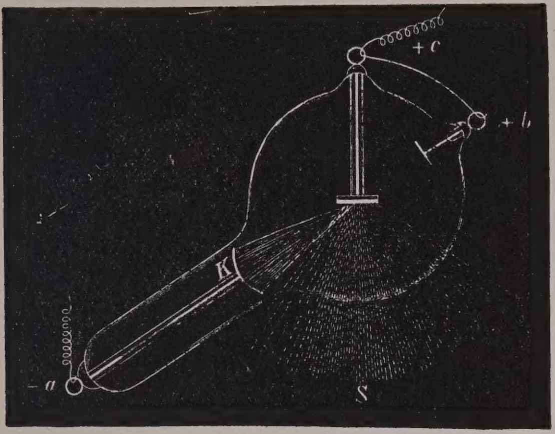
Rod'man, Thomas J., was born at Salem, Ind., in 1816, and after graduating at the United States Military Academy was commissioned lieutenant of ordnance in 1841. To him belongs the honor of inventing a method of casting large guns about a hollow core and cooling the metal from the inside. He died at Rock Island, Ill., June 7, 1871.

Rodrigues (*rō-drē'gĕs*) is a volcanic island 375 miles east by north of Mauritius of which it is a dependency. Its area is 42 square miles, population 3,200, of whom less than 200 are pupils in the government-schools. The Portuguese discovered the island in 1645, the British took possession in 1814, and its isolation in the Indian Ocean, which prevents changes among its animals and plants, makes it important to zoölogists and botanists. The solitarie, a bird now extinct, survived here almost until 1700. The chief export is cocoa-oil.

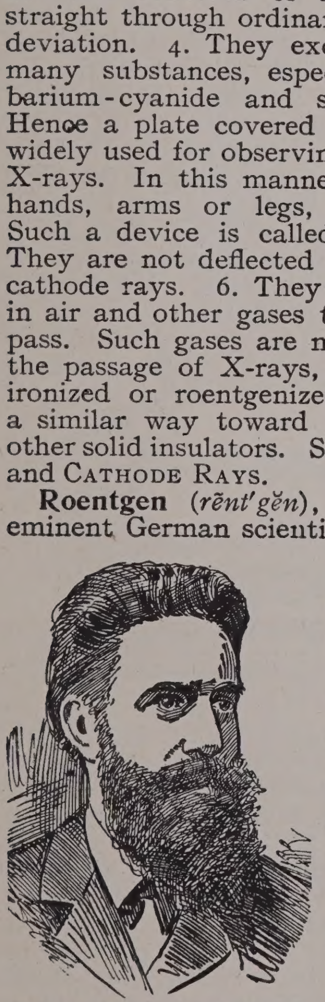
Roem'er, Ole, a Danish astronomer, is known principally as the man who first discovered that light travels with a finite speed. Born in 1644, he died in 1710. He was educated at the University of Copenhagen. The years from 1672 to 1681 he spent in the Paris Observatory. Then he returned to Copenhagen as professor of astronomy, a position which he held until death. During his Parisian residence he studied the motion of Jupiter's satellites and showed from inequalities in the motion of the first satellite that the speed of light across the orbit of the earth is approximately 309,000,000 meters a second, a result which is not so very far — perhaps three per cent.— from the best modern measures. Roemer devised the transit instrument, the meridian circle and the alt-azimuth instrument; but he was in advance of his times and adoption of his inventions was delayed until many years after his death. See Grant's *History of Physical Astronomy.*

Roentgen (*rĕnt'gĕn*) **Rays.** About the beginning of 1896 Roentgen, a German physicist long and favorably known to the scientific world, discovered that rays which *in many respects* are similar to Lenard's can be observed through a very large region outside of an ordinary Crooke's tube. These are the so-called X-rays. Among the most important properties of these rays are the following:

1. They take their origin at those points where cathode rays strike upon matter. Thus, in the accompanying figure the cone of rays leaving the curved cathode K are cathode rays, while the sheaf of rays, S, leaving the flat plate are X-rays. 2. Unlike cathode rays, they pass through glass, air and various materials with little absorption. 3. Unlike ordinary light, they are not reflected or refracted, but pass straight through ordinary material without deviation. 4. They excite fluorescence in many substances, especially in platinum-barium-cyanide and some similar salts. Hence a plate covered with these salts is widely used for observing shadows cast by X-rays. In this manner the bones of the hands, arms or legs, are easily "seen." Such a device is called a *fluoroscope*. 5. They are not deflected by a magnet as are cathode rays. 6. They produce electrolysis in air and other gases through which they pass. Such gases are made conductors by the passage of X-rays, and are said to be ironized or roentgenized. They behave in a similar way toward paraffine and some other solid insulators. See Becquerel Rays and Cathode Rays.



ROENTGEN-RAY TUBE



PROFESSOR ROENTGEN

Roentgen (*rĕnt'gĕn*), **Wilhelm Konrad,** eminent German scientist, distinguished investigator of physical problems and discoverer of the X or Roentgen rays, was born in Düsseldorf, Prussia, in 1844. Educated at Zürich and Utrecht, he became professor of physics and director of the laboratory at the University of Würzburg, Bavaria. He also taught at Strassburg and at Giessen. In December, 1895, he communicated to the Würzburg Physico-Medical Society his remarkable discovery of the new and powerful X-rays, since known by his name, and in the following month he described his discovery at the celebration of the semicentennial of the founding of the Berlin Physical Society. Later he demonstrated the rays in the presence of the Emperor of Germany, who decorated him, and Prince Ludwig of Bavaria created him a baron. The application of the X-rays in surgery has been fraught with wonderful and beneficent results. By the X-ray picture pulmonary tuberculosis is better detected, and heart-disease can be more accurately learned from it than by percussion of the chest.

Rog'ers, Henry Wade, LL.D., American educator and legal authority, was born at Holland Patent, N. Y., Oct. 10, 1853, and educated at the University of Michigan, Ann Arbor. He studied law and in 1877 was admitted to the bar. Later he became professor of law and dean of the law-faculty in his *alma mater*. In 1890 he was appointed president of Northwestern University, resigning in 1900 and in 1901 accepting the chair of constitutional law at Yale. He was the author of *Expert Testimony* and *Illinois Citations*, and for some years edited *The American Law Register*. He died in 1913.

Rogers, John, American sculptor and modeler, was born at Salem, Mass., Oct. 30, 1829, and was educated at the public schools of Boston. Early in life he became interested in clay-modeling, and in 1858 went to study art in Europe. Returning to the United States in 1859, he modeled a group, *The Checker-Players*, which attracted favorable attention; after this he took scenes occurring in the Civil War as themes of his compositions; these were soon known as Rogers' Groups and well merited their popularity. The best known, some of which were reproduced in terra-cotta, are the *Picket Guard* and *One More Shot*, besides those of a social character, as *The Favorite Scholar*, *Coming to the Parson*, *Going for the Cows* and *The Slave-Auction*. He also produced a large equestrian statue of General Reynolds, which fronts the city-hall of Philadelphia. He died in July of 1904.

Rogers, Randolph, American sculptor, was born at Waterloo, N. Y., July 6, 1825, and, after following mercantile pursuits in early life, went to Rome to study the sculptor's art. Among his works are the designs for the Washington monument at Richmond, Va., a statue of John Adams in Mt. Auburn cemetery, a memorial monument at Providence, Rhode Island, a still larger one for Michigan at Detroit and the bronze statue of Lincoln at Philadelphia. He died at Rome, Jan. 15, 1892.

Rogers, Samuel, English poet was born at Stoke-Newington, July 30, 1763. After obtaining a private education, he entered his father's bank in London at 17, and in 1793 became head of the firm. In 1792 appeared the poem on which his fame is chiefly based, *The Pleasures of Memory*, which in 1816 had reached a nineteenth edition. Then followed *An Epistle to a Friend*, *Voyage of Columbus*, *Jacqueline* and *Italy*. Rogers was rich; but his poetry, whatever its merits, is wholly a thing of the past. It is now but little read or quoted. He died at London, Dec. 18, 1855.

Rojestven'ski, Sinovi Petrovich (1848–). See Russo-Japanese War.

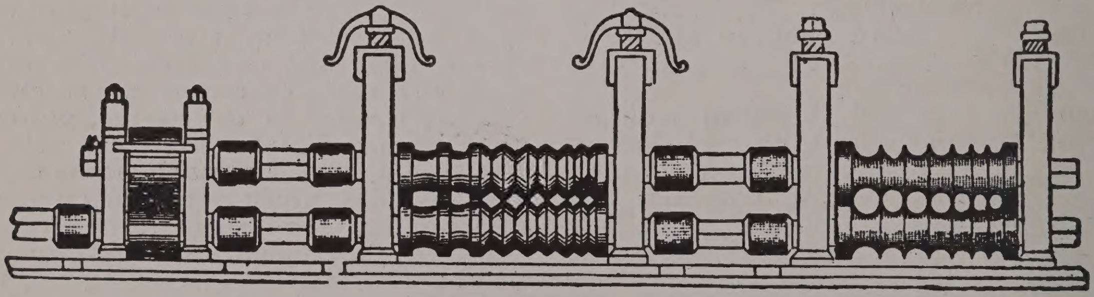
Ro'land, the hero of one of the most popular epic poems of Frankish literature, was, according to tradition, the nephew and favorite captain of Emperor Charlemagne. Through the middle ages the *Song of Roland* was the most popular of the many poems current; and William of Normandy, when on his way to conquer England, had it sung at the head of his troops to encourage them on their march. Even now the memory of Roland is still held in honor by the hardy mountaineers of the Pyrenees, among whose defiles the scene of his exploits is laid.

Roland (*rō'län'*), **Marie** (or **Manon**) **Jeanne Phlipon,** was born at Paris, March 18, 1754. From a child she was a great reader, devouring all that came in her way, and the reading of Plutarch made her a republican. In February, 1780, she married Roland, who afterwards became the leader of the Girondists. In 1791, in Paris, Madame Roland, with her masculine intellect and woman's heart, became the queen of a coterie of young and eloquent enthusiasts that included all the famous and ill-fated leaders of the Gironde, Brissot, Buzot, Petion and at first even Robespierre and Danton. Roland made himself hateful to the Jacobins by his protests against the September massacres, and took his part in the last ineffectual struggle of the Girondists to form a moderate party. On May 31 the sound of the tocsin announced the proscription of the 22. Roland had been arrested, and while his wife went to protest against his imprisonment, he escaped and fled to Rouen. She was arrested and spent months in prison before death closed her tragedy of life. During this time she wrote her unfinished *Mémoires*. Her character, made perfect through suffering, took on a new refinement; she carried some of the sanctity of the martyr with her to death, and still, in Carlyle's phrase, like a white Grecian statue, serenely complete, she shines in that black wreck of things. On Nov. 8 (1793) she was carried to the guillotine with a trembling printer, whom she asked the executioner to take first, to save the printer the horror of seeing her head fall. As she looked up at the statue of liberty, she exclaimed: "O Liberty, what crimes are committed in thy name!" A week later her husband died by his own hand near Rouen, unwilling to live longer in a world of crime. See Sainte-Beuve's *Portraits of Women.*

Roller-Skate. See Skating.

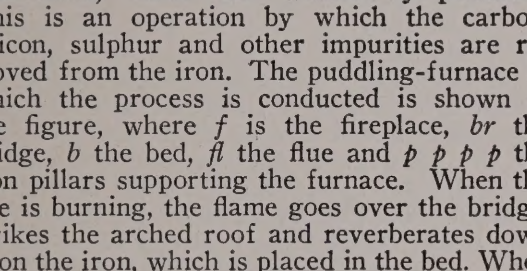
Rol'lin, Charles, a French historian, was born in Paris in 1661. He studied in the *Collége du Plessis*, in which he became assistant-professor of rhetoric in 1683. In 1688 he was made professor of eloquence in the *Collége de France* and was chosen rector of the University of Paris in 1694, a position which he held for two years only. In this short time, however, he was able to distinguish himself by many important reforms. In 1696 he was appointed coadjutor to the principal of the *Collége de Beauvais*, from which, being an ardent Jansenist, he was removed through the influence of opponents in 1712. The remainder of his life was devoted to study and to writing. He published an edition of Quintilian in 1715 and *Traite des Etudes* in 1726. His *Histoire Ancienne* has been frequently reprinted and re-edited in French and in English. He began a *Histoire Romaine*, but never completed it. These works once were popular, but now are of little historical value. He died at Paris in September of 1741.

Roll'ing-Mills are machines rotated by steam-power and used for manufacturing rods, bars, plates, beams etc. of metal. The rolls usually are of cast-iron, and are made in various forms according to the shape of the product. The cut shows rolls used for making square bars and round rods. Those used for making plates and sheets of metal are perfectly smooth, and are gradually brought together, as the metal is passed through, by means of the screws at the top. The picture shows a train of two rolls where the piece has to be brought back to the


ROLLING–MILL

same side for each passage through the rolls, unless the machinery is reversed in direction each time. Trains of three rolls are frequently employed, so that the rolling takes place back and forth, first between the lower two rolls, then between the upper two. Steel, wrought iron, copper and brass as well as other metals and alloys are frequently rolled. Usually the metal is rolled while hot, but certain products are finished by cold rolling in order that they may be harder and stiffer. All the steel and iron rails used for steam and electric roads, as well as the beams and bars used for buildings and bridges, are produced by rolling.

PUDDLING. Pig-iron, the crude form of iron which is produced from iron-ore by smelting, is changed to wrought-iron, a metal that can be hammered, rolled and welded by puddling. This is an operation by which the carbon, silicon, sulphur and other impurities are removed from the iron. The puddling-furnace in which the process is conducted is shown in the figure, where *f* is the fireplace, *br* the bridge, *b* the bed, *fl* the flue and *p p p p* the iron pillars supporting the furnace. When the fire is burning, the flame goes over the bridge, strikes the arched roof and reverberates down upon the iron, which is placed in the bed. When the roof, walls and bed of the furnace are moderately heated, the puddler "fettles" his furnace by plastering the bed and sides with a fettling composition, which consists of ground oxide of iron made into a paste with water. The crude iron is now thrown in, the fire made and the charge heated. During the melting the puddlers stir the mass with a long iron rod. Presently the heated mass thickens, and solid granules are formed amid the liquid. These solid granules are squeezed together into a spongy mass or ball and rapidly carried to the hammer, where it is struck lightly at first and compressed into shape. During this beating or "shingling" liquid cinders are squeezed from the mass like water from a sponge. The puddled iron is then passed through rollers by which further impurities are squeezed out, and the iron is formed into bars, plates or thin sheets, as is desired for different purposes of manufacture. The puddling and rolling of iron was first practically developed by Henry Cort in England in 1784, and since then many improvements have been introduced. Puddling has lost much of its importance since the introduction of mild steel, made by the Bessemer and open-hearth processes, which has to a great extent taken the place of wrought iron.



PUDDLING-FURNACE

Romagna (*rō̆-m̱än'yä*), formerly the name of a region of Italy, forming the northern portion of the states of the church and comprising the *delegations* of Bologna, Ravenna, Ferrara and Forli. In 1861 these delegations became provinces of the kingdom of Italy.

Roman Catholic Church, or the **Universal Church**, that portion of Christendom which embraces the Christian religion purported to have been established by Christ, and therefore a "divine institution," at the head of which is the temporal guardian, Christ's vicar on earth, the Supreme Pontiff, Pope Pius XI. A distinction must be understood to exist between the "visible body" of the Church and the "soul" of the Church. The former is that organization created by the Christ, as a way to salvation with its "visible foundation" St. Peter. The Roman Catholic Church holds that Christ built His Church upon Peter, when He addressed Simon Peter, "Blessed art thou, Simon Bar-Jona, because flesh and blood hath not revealed it to thee, but My Father who is in Heaven. And I say to thee, that thou art Peter (rock), and upon this rock I will build My Church, and the gates of Hell shall not prevail against it" (Matt xvi; 16-19). Peter, therefore, became the "visible" head of the Church, Christ the "invisible" head. He established his Church at Rome. This primacy granted to Peter, is not a primacy of honor alone, but also of jurisdiction, his power proceeding from Christ Himself, hence the monarchical constitution of the Church.

The Roman Pontiff, the Pope, is the successor of St. Peter in the "primacy" over the Church, and hence the supreme ruler over the whole of Christendom. As successor to the "visible" head of the Universal Church, the Pope succeeds to every right of the apostolic see, and receives his power of jurisdiction directly from the Christ. The "soul" of the Church, on the other hand, constitutes those Christians who are "in good faith."

The Church is called "Catholic" because it has endured through the ages maintaining all truth, and its members, scattered in great numbers throughout the entire world, are representative of the largest body of Christians in existence. The Roman Catholic Church is termed the "Apostolic Church" because of its origin, its bishops being descended from the Apostles and its Pontiff the direct successor of St. Peter.

Church Worship. High ritual attends the services of the Roman Catholic Church, ritual which is embodied in the Missal (Book of the Mass), and the Breviary which contains the Divine Office or prayer.

The Divine Office is constituted in seven divisions (canonical hours): matins (the morning office); lauds; prime; terce; sext; none; vespers, and compline. All priests of the Church are required to recite this Divine Office each day. The Mass, the principal act of worship in the Church, may be either said or sung in Latin, the language of the Church. In addition to the Mass, are the "non-liturgical devotions" which include the Forty Hours' Adoration, commemorating the forty hours in which the body of Christ remained in the Holy Sepulchre; the Rosary, in honor of the Virgin Mother Mary; Devotions to the Sacred Heart of Jesus; the Stations of the Cross of which there are fourteen.

Sacraments. Those sacred rites or ceremonies of the Church which, as outward signs instituted by Jesus Christ, communicate grace to the soul are termed "sacraments" by the Church. These sacraments consist of two elements, matter and form. The words which accompany a sacrament, providing the full signification to the action of that sacrament, constitute the "form" of that sacrament. The action which accompanies the words, is called the "matter" of the sacrament. There are but seven of these sacraments in the Roman Catholic Church: Baptism; Confirmation; Penance; the Eucharist or Holy Communion; Extreme Unction; Holy Orders, and Matrimony. These seven sacraments were instituted by Christ and declared by the Council of Trent. The doctrine of the seven sacraments was universal in the Church as early as the twelfth century. The sacraments of the Church are further divided into sacraments of the living, which include Confirmation, Holy Eucharist, Extreme Unction, Holy Orders, and Matrimony, and the sacraments of the dead, Baptism and Penance. The latter sacraments are termed "sacraments of the dead" because they may be received by individuals who have, through mortal sin, became spiritually dead. Of the seven sacraments, three may be received only once, Baptism, Confirmation, and Holy Orders. The Council of Trent and the Council of Florence declare that these sacraments "imprint a permanent and indelible character upon the soul." The sacraments of the Church were instituted by Christ.

The sacramentals, which differ from the sacraments in that they were instituted by the Church and not by Christ, are the sign of the Cross, holy water, holy oils, blessed candles, and blessed ashes.

Church Doctrines. The doctrines of the Roman Catholic Church are to be found in the Apostles' Creed, the Athanasian Creed, the Nicene Creed, the Creed of Constantinople (also called the Nicene Creed), and the Lateran Creed, as well as in the Ecumenical Councils, which began with the Council of Nice in 325 A. D., and continued through to the Vatican Council which convened in 1869 under Pope Pius IX, and in the *ex cathedra* deliverances of the Roman Pontiff. The Church doctrines include authority of apostolic and ecclesiastical traditionals, the infallibility of the Pope, purgatory, and Immaculate Conception, transubstantiation, and the sacraments.

Members of the Church are bound by certain laws which demand an observance of Sundays and Holy Days by hearing of the Mass; observance of the Lenten season and fasting on certain days, particularly an abstinence from meat on Friday; confession at least once during the year; Communion at Eastertide attended by an absolute fast from midnight of the date preceding the reception of Communion; and strict regard to the proper time and certain conditions regarding marriage.

The church clergy is bound to its obligation of celibacy which begins with the office of subdeaconship. The clergy is also obliged to recite each day the canonical hours, or the Divine Office as contained in the Breviary.

Church Government. At the head of the hierarchy of the Roman Catholic Church is the Supreme Pontiff, the Pope. The present pontiff, Pope Pius XI, was born Achille Ratte at Desio, Italy, on May 31, 1857. He became Archbishop of Milan on June 16, 1921. On June 1 of that year he was proclaimed a Cardinal. On February 6, 1922, he was elected to succeed Benedict XV as the Supreme Pontiff of the Church. His coronation occurred on February 12, 1922. In orders, the pontiff is a Bishop. His title as head of the Church is, His Holiness, the Pope; Bishop of Rome and Vicar of Jesus Christ; successor of St. Peter, Prince of the Apostles; Supreme Pontiff of the Universal Church; Patriarch of the West; Primate of Italy; Archbishop and Metropolitan of the Roman Province; Sovereign of the State of the Vatican City (a temporal title).

The Pope is assisted by the College of Cardinals and eleven committees called the Sacred Congregations. The College of Cardinals acts in the capacity of a supreme council or senate of the Church. It is comprised of seventy members: six Cardinal-Bishops, fifty Cardinal-Priests, and fourteen Cardinal-Deacons. These Cardinals are appointed by the Pope, act as advisers to the pontiff and when occasion demands it, elect a new Pope.

The Sacred Congregations are concerned with the central administration of the Church. These eleven committees include Holy Office, Concistorial, Discipline of the Sacraments, Council, Religious, Propaganda Fide, Eastern Church, Sacred Rites, Ceremonial, Extraordinary, Ecclesiastical Affairs, Seminaries and Universities. The central administration is also carried on by three Tribunals: Sacred Penitentiary, Sacred Roman Rota, and the Apostolic Segnatura.

Diplomatic relations are maintained by the Holy See with twenty-three foreign nations, and with the majority of American republics with the exception of the United States, Cuba, Mexico, and Uruguay. Negotiations were begun in 1929 to effect concordats with Prussia, Portugal and Rumania. Similar negotiations were begun with Germany in 1933.

Church History. The history of the papacy, which inevitably follows the history of the Christian world, is generally divided into three eras or periods. During the first era, which extends over the first seven hundred years of

Christian history, the persecution of Christians in the struggle to destroy paganism was in progress. It was in the administration of Pope Victor I, who was elected Pope in 193, that the aggressive and dominating jurisdiction of the Roman Catholic Church first became apparent. His policies to secure uniformity in the outward practices of the Church were actively carried out by his successors, Pope Leo I and Pope Gregory I, the Great. Although the foundations of a well-developed papal power were established by Victor I, it was not until 440, while Leo I occupied the Papal Chair, that this power was fully realized. Pope Leo I sought to establish papal vicariates in both the Eastern and Western worlds through which the Church could enforce its jurisdiction and maintain the Roman forms of faith and Church practices.

The second era of the history of the Roman Catholic Church begins with the coronation by Pope Leo III of Charles the Great as Roman Emperor. There followed the conversion of the barbarians, and the development of the Western Empire. It was also during this period that the Church found it necessary to struggle for the maintenance of its independence, a struggle from which the Church emerged the victor.

In 1431 the Emperor Sigismund, by his assembly of the Council of Basel, renewed the attacks upon the authority of the Pope. It was this event which ushered in the third era of Church history. The Protestant revolt which ensued threatened the stability of the Church and accomplished the destruction of the unity of European religious belief. The Council of Trent, which convened in 1545-63, was assembled for the purpose of counteracting the effects of the Protestant revolt. This era is also marked by the extension of the faith to India, Japan, and the New World. The French Revolution, and the overthrow of the comity of European nations was but coincident with the destruction of the unity of European religious belief. The struggle between Church and State continued, and wherever absolute religious freedom prevailed, the church prospered.

With the opening of the nineteenth century the Church seemed to regain a lost foothold in a majority of European countries. Shortly after the Catholic Emancipation Act in 1829 in England Catholics once more came into prominence. In America the Roman Catholic Church has had an astounding growth. In 1932 there were 20,146,168 communicants of the Church in the United States. From 1870 until 1929, the Popes of the Church remained virtual prisoners, refusing to leave the Vatican Palace. In 1870 the Papal States and the city of Rome were annexed to the Kingdom of Italy and removed from the jurisdiction of the Roman Church. In 1929, however, there was created the Vatican City, the residents of which are all papal subjects. Here the Pope exercises sovereignty, and full legal, executive and judicial powers in the Vatican.

POPES OF THE ROMAN CATHOLIC CHURCH

Name of Pope	Date of Consecration
St. Petrus	42
St. Linus	67
St. Cletus	78
St. Clement I	90
St. Anacletus	100
St. Evaristus	112
St. Alexander I	121
St. Sixtus I	132
St. Telesphorus	142
St. Hyginus	154
St. Pius I	158
St. Anicetus	c167
St. Soterus	c175
St. Eleutherus	c182
St. Victor I	193
St. Zephyrinus	203
St. Calixtus I	221
St. Urbanus I	227
St. Pontianus	233
St. Anterus	238
St. Fabianus	239
St. Cornelius	253
St. Lucius I	255
St. Stephanus I	257
St. Sixtus II	260
St. Dionysius	261
St. Felix I	272
St. Eutychianus	275
St. Caius	283
St. Marcellinus	296
St. Marcellus I	304
St. Eusebius	309
St. Melchiades	311
St. Sylvester I	314
St. Marcus	337
St. Julius I	341
St. Liberius	352
St. Felix II	363
St. Damasus	367
Ursinus, (Anti-Pope)	366
St. Siricius	384
St. Anastasius I	399
St. Innocentius I	402
St. Zosimus	417
St. Bonifacius I	418
St. Celestinus I	423
St. Sixtus III	432
St. Leo I	440
St. Hillarus	461
St. Simplicius	468
St. Felix III	483
St. Gelasius I	492
St. Anastasius II	496
St. Symmachus	498
St. Hormisdas	514
St. Joannes I	523
St. Felix IV	526
Bonifacius II	530
Joannes II	532
St. Agapetus I	535
St. Silverius	536
Vigilius	538
Pelagius I	555
Joannes III	560

Name of Pope	Date of Consecration
Benedictus I	574
Pelagius II	578
St. Gregorius I	590
Sabinianus	604
Bonifacius III	607
St. Bonifacius IV	608
St. Deusdedit I	615
Bonifacius V	619
Honorius I	625
Severinus	640
Joannes IV	640
Theodorus I	642
St. Martinus I	649
St. Eugenius I	655
St. Vitalianus	657
Deusdedit II	672
Donus I	676
St. Agatho	678
St. Leo II	682
St. Benedictus II	684
Joannes V	685
Conon	686
St. Sergius I	687
Joannes VI	701
Joannes VII	705
Sisinnius	708
Constantinus I	708
St. Gregorius II	715
St. Gregorius III	731
St. Zacharius	741
Stephanus II	752
St. Stephanus III	752
St. Paulus I	757
Stephanus IV	768
Hadrianus I	771
St. Leo III	795
St. Stephanus V	816
St. Paschalis I	817
Eugenius II	824
Valentinus	827
Gregorius IV	827
Sergius II	844
St. Leo IV	847
Benedictus III	855
St. Nicolaus I	858
Hadrianus II	867
Joannes VIII	872
Martinus II	882
St. Hadrianus III	884
Stephanus VI	885
Formosus	891
Bonifacius VI, (Anti-Pope)	896
Stephanus VII	896
Romanus	897
Theodorus II	898
Joannes IX	898
Benedictus IV	900
Leo V	903
Christophorus	903
Sergius III	904
Anastasius III	911
Landonius	913
Joannes X	915
Leo VI	928
Stephanus VIII	929

Name of Pope	Date of Consecration
Joannes XI	931
Leo VII	936
Stephanus IX	939
Martinus III	942
Agapetus II	946
Joannes XII	956
Leo VIII	963
Benedictus V	964
Joannes XIII	965
Benedictus VI	972
Donus II	973
Bonifacius VII, (Anti-Pope)	974
Benedictus VII	975
Joannes XIV	984
Joannes XV	985
Gregorius V	996
Joannes XVI, (Anti-Pope)	997
Sylvester II	999
Joannes XVII	1003
Joannes XVIII	1003
Sergius IV	1009
Benedictus VIII	1012
Joannes XIX	1024
Benedictus IX	1033
Gregorius VI	1044
Clement II	1046
Damasus II	1048
St. Leo IX	1049
Victor II	1055
Stephanus X	1057
Benedictus X, (Anti-Pope)	1058
Nicolaus II	1059
Honorius II, (Anti-Pope)	1061
Alexander II	1061
St. Gregorius VII	1073
Clement III, (Anti-Pope)	1080
Victor III	1087
Urbanus II	1088
Paschalis II	1099
Gelasius II	1118
Gregorius VIII, (Anti-Pope)	1118
Calixtus II	1119
Honorius II	1124
Innocentius II	1130
Anacietus II, (Anti-Pope)	1130
Victor IV, (Anti-Pope)	1138
Celestinus II	1143
Lucius II	1144
Eugenius III	1145
Anastasius IV	1153
Hadrianus IV	1154
Alexander III	1159
Victor V, (Anti-Pope)	1159
Paschalis III, (Anti-Pope)	1164
Lucius III	1181
Urbanus III	1185
Gregorius VIII	1187
Clement III	1187
Celestinus III	1191
Innocentius III	1198
Honorius III	1216
Gregorius IX	1227
Celestinus IV	1241
Innocentius IV	1243
Alexander IV	1254

Name of Pope	Date of Consecration
Urbanus IV	1261
Clement IV	1265
Gregorius X	1271
Innocentius V	1276
Hadrianus V	1276
Joannes XX	1276
Nicolaus III	1277
Martinus IV	1281
Honorius IV	1285
Nicolaus IV	1288
St. Celestinus V	1294
Bonifacius VIII	1294
Benedictus XI	1303
Clement V	1305
Joannes XXI	1316
Nicholas V, (Anti-Pope)	1328
Benedictus XII	1334
Clement VI (Avignon)	1342
Innocentius VI (Avignon)	1352
Urbanus V (Avignon)	1362
Gregorius XI (Avignon)	1370
Urbanus VI	1378
Clement VII (Avignon)	1378
Benedictus XIII (Avignon)	1394
Bonifacius IX	1389
Innocentius VII	1404
Gregorius XII	1406
Alexander V	1409
Joannes XXII	1410
Martinus V	1417
Clement VIII, (Anti-Pope)	1424
Eugenius IV	1431
Felix V, (Anti-Pope)	1440
Nicolaus V	1447
Calixtus III	1455
Pius II	1458
Paulus II	1464
Sixtus IV	1471
Innocentius VIII	1484
Alexander VI	1492
Pius III	1503
Julius II	1503
Leo X	1513
Hadrianus VI	1522
Clement VII	1523
Paulus III	1534
Julius III	1550
Marcellus II	1555
Paulus IV	1555
Pius IV	1559
St. Pius V	1566
Gregorius XIII	1572
Sixtus V	1585
Urbanus VII	1590
Gregorius XIV	1590
Innocentius IX	1591
Clement VIII	1592
Leo XI	1605
Paulus V	1605
Gregorius XV	1621
Urbanus VIII	1623
Innocentius X	1644
Alexander VII	1655
Clement IX	1667
Clement X	1670
Innocentius XI	1676
Alexander VIII	1689
Innocentius XII	1691
Clement XI	1700
Innocentius XIII	1721
Benedictus XIII	1724
Clement XII	1730
Benedictus XIV	1740
Clement XIII	1758
Clement XIV	1769
Pius VI	1775
Pius VII	1800
Leo XII	1823
Pius VIII	1829
Gregorius XVI	1831
Pius IX	1846
Leo XIII	1878
Pius X	1903
Benedictus XV	1914
Piux XI	1922

Roman Empire. To give an adequate history of this mighty nation from the alleged founding of Rome by Romulus in 753 B. C. to the taking of Constantinople in 1453 A. D. would require many volumes. Concerning the early settlement of Italy it is impossible to form definite conclusions; but we seem at least warranted in affirming that at a very remote period a race emigrated from the east, embracing the ancestors both of Greeks and Italians; and the statement of Mommsen the historian that "the Italians, like the Indians, entered their peninsula from the north" may be regarded as certain. But in addition to the so-called Italian races, there settled in Italy in prehistoric times the Iapygians, the Etruscans, the Greeks and the Gauls, and from the mingling of all these came the people of Rome.

It is quite probable that Rome was first built as a defense against the Etruscans and as an emporium for river-traffic; but whether it was founded by the Latin confederacy or by the enterprise of an individual chief is beyond conjecture. The motives which led to the founding of Rome also caused its rapid development, so that the beginnings of Roman history—if the ancient legend may be called history—mainly are records of the city's expansion and growth. An accurate history of the early Roman state is out of the question, as the traditions concerning the first four kings are too mythical to form the basis of sober narrative; but with the fifth king, Tarquinius Priscus, a marked change takes place, and we can at least feel that we are beginning to leave the field of tradition and approach that of history. The expulsion of the younger Tarquin about 509 B. C. in revenge for the outrage on Lucretia marks the overthrow of the monarchy and the establishment of the so-called republic.

The history of Rome from the establishment of the republic to the abolition of the decemvirate, 449 B. C., was chiefly military, as the Romans were engaged in constant wars with their neighbors, especially the

Etruscans. These conflicts continued until 295 B. C., when the final victory over the Samnites and Etruscans ended the struggle and brought all Italy under Roman dominion. Having thus extended her power over Italy, it was but natural that Rome should become involved in wars with foreign nations; and in 264 B. C. began the terrible contest with Carthage, which comprised three separate wars, known as the three Punic wars, which closed only with the complete destruction of Carthage more than a century later. In connection with the Punic wars began the Macedonian wars — also three in number — which ended with the battle of Pydna, 168 B. C., in which the Macedonian empire was completely broken up. According to Polybius the full establishment of the Roman empire was achieved at Pydna, as this was the last battle in which she was confronted by a civilized nation; all her subsequent wars were against rebellions of her own provinces or in contests with so-called barbarians. The subsequent history of the republic — the war with Jugurtha, the Servile wars, the civil wars of Marius and Sulla, the campaigns of Julius Cæsar, the civil wars between Cæsar and Pompey and the final assumption of power by Octavius Cæsar under the title of Augustus—has been given under appropriate heads, and need not be repeated here. When Augustus died, 14 A. D., the Roman empire extended in the north into Germany beyond the Rhine; in the east the boundary line was the Euphrates; in the south Egypt and northern Africa as far west as Morocco and as far inland as Fezzan and Sahara acknowledged the Roman authority. The subsequent reigns of Tiberius, Caligula, Claudius and Nero are little more than the record of conspiracies, assassinations and acts of tyranny; but the with reign of Vespasian, 69 A. D., a better era commenced, which, if we except the reign of Domitian, continued for the next hundred years and comprised the reigns of Titus, Nerva, Trajan, Hadrian and Marcus Aurelius, the latter of whom, especially, was one of the wisest and most beneficent rulers the world has known. Nothing is clearer than the fact that after the time of Vespasian the worst days of Rome were over. Never again did she give way to the immorality and corruption of the first century.

During the rule of Valerian, Gallienus and the so-called Thirty Tyrants the empire was chaos, subject to inroads and invasions from barbarians; but with Claudius Gothicus its fortunes begin to brighten. By him and his successors (Aurelian, Probus and Carus) the barbarians both of the north and of the east were severely chastised, and when Diocletian became emperor 284 A. D., it seemed as if the worst was over; but his division of the empire into east and west led to civil wars, which were brought to a close only by the commanding genius of Constantine. Under Constantine, who reigned from 324 to 337 A. D., Christianity, which had hitherto been despised and persecuted, was established as the religion of the state and taken under the protection of the emperor. Constantine also transferred the seat of government from Rome to Byzantium on the Bosporus, where he founded Constantinople, naming it after himself. From the time of Constantine the political fortunes of Rome possess only a secondary interest, as it is the struggles of the Christian sects and the rise of the church that mainly occupy the attention of the historian. Christianity did not save Rome from destruction, but it enabled it to endure three centuries of barbarism. Julian's attempts to revive paganism were an utter failure in spite of his abilities as a general and the virtues of his personal character; and in the year after his death Valentinian was acknowledged as emperor by the army at Nicæa. In obedience to the wish of his soldiers he conferred the title of Augustus upon his brother Valens, and the complete division of the empire was at last effected, Valentinian becoming emperor of the west and Valens of the east. Valentinian, Gratian and Theodosius the Great were rulers worthy of better times; but they struggled against destiny, and their efforts were vain. Theodosius, indeed, subdued and even disarmed the Huns, by whom Rome was invaded; but immediately after, they rose again under Alaric against Honorius, emperor of the west. Rome was saved for the time by the bravery and skill of Stilicho, the imperial general; but after his assassination the barbarians returned, sacked the city and ravaged the entire peninsula.

The murder of Valentinian III occurred in 455 A. D., and Eudoxia, his widow, to be revenged on Petronius Maximus, his murderer and successor, invited Genseric from Africa, thus exposing Rome to the horrors of pillage for days. Ricimer, a Sueve, next figures as a sort of governor over the city and the few relics of empire that it still possessed; for Gaul, Britain, Spain and western Africa had all been wrested from it. Of the four emperors whom Ricimer placed on the throne, Majorian was the only one who had any of the qualifications of a ruler. Ricimer died in 472, and was succeeded by Orestes the Pannonian. Odoacer in 476, placing himself at the head of the barbarian mercenaries, overthrew the last emperor of the western empire, who, by a curious coincidence, bore the same name as the mythical founder of the city — Romulus. This was the end of the western empire; but for nearly a thousand years thereafter the eastern empire, whose capital was Constantinople, maintained its existence in spite of all the enemies by which it was surrounded, until Constantinople was taken by Mohammed II in 1453. Consult Gibbon's *Decline* *and Fall of the Roman Empire*, Merivale's *Romans under the Empire*, Duruy's *History of Rome*, Bryce's *Holy Roman Empire* and Bury's *The Later Roman Empire*. See, also, ROME.

Romance′, a term derived from Roman, was originally applied to the languages which have been derived from Latin, as French, Italian or Spanish, and to anything written in these languages. But, because during the middle ages the favorite literature in these languages was a certain type of fiction, *romance* came to be the special designation of the tales of chivalry and adventure which were sung by troubadours generally in verse Romances of this type sprang from the epic. Thus it has been pointed out that the *Odyssey* is more a romance than the *Iliad;* because to a greater degree than the *Iliad* it obviously is imaginative rather than historical. The romances of the middle ages were developed into what are called cycles, in each of which a related group of persons and their achievements became grouped around a central figure. The greatest of these cycles were those which centered around the siege of Troy and the adventures of Alexander the Great, Charlemagne and King Arthur respectively. In the tales about Arthur, Sir Tristram won so great a place that a cycle of Tristram also grew up almost independently of the tales of Arthur's court. There were English cycles of romance spun about the legendary names of Guy of Warwick and Bevis of Hampton. The Norse sagas and the Teutonic *Nibelungenlied* are modified forms of the romance.

Out of these medieval romances developed the notion of the modern romance or novel. The beginning of the modern romance may be traced in the Spanish tale of *Amadis of Gaul*, the famous *Arcadia* of Sir Philip Sidney, the French *L'Astrée* of Honoré d' Urfé and the long stories of Madeline de Scudery. The first modern novels in the strict technical sense of the term were those of Richardson and Fielding in the eighteenth century.

In music, romance has reference to a type of song which lies between the epic and lyric and suggests a ballad, except that its theme belongs to the realm of chivalry. The word romance has not lost the significance which became attached to it in the middle ages. It suggests chivalry, especially towards women, lofty endeavors, gallantry pushed to foolhardiness, an elaborate and artificial code of honor and conduct, a purely aristocratic attitude and an appeal to the imagination rather than to nature.

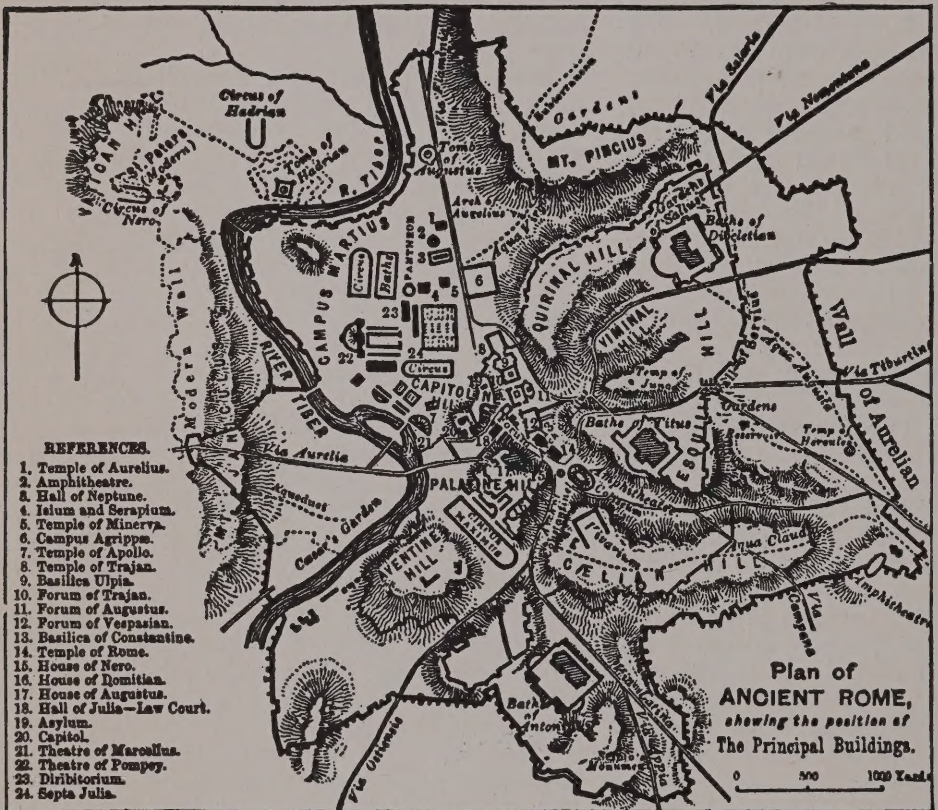
Romanes (*rō-mä′nĕs*), **George John,** British biologist, author and lecturer, was born at Kingston, Canada, May 20, 1848. and died at Oxford, May 23, 1894. Educated at Cambridge, England, his taste for natural science led him to study, investigate and write upon that branch of knowledge and to lecture at the Royal Institution, London, and later at Oxford, on natural history, physiology and animal and plant life. Making acquaintance with Darwin, he devoted much of his talent to the scientific exposition of evolution, taking ground adverse at first to the accepted Christian view of that doctrine, though finally expressing belief in the theistic position and opposing the mechanical theories of the origin of things. His publications include (besides a number of articles on instinct, hybridism and animal intelligence) *A Candid Examination of Theism*, *Mental Evolution in Animals*, *Mental Evolution in Man*, *Organic Evolution*, *Darwin and after Darwin*, *Jelly-Fish, Star-Fish and Sea-Urchins*, *Examination of Weismannism* and *Thoughts on Religion*. See *Life and Letters*, edited by his wife.

Romanoff (*rō-mä′nōf*), **The House of,** furnished the royal rulers of Russia from the early part of the seventeenth century. Rurik, the chief of the Varangians or Rus, laid the foundation of the Russian empire, and he and his family reigned over it for more than seven centuries. Feodor, the last descendant of the Rurik dynasty, dying childless in 1594, the government fell a prey to many adventurers. The legitimate heir to the throne, Dimitri, of the Rurik dynasty, was assassinated, and no less than four impostors arose, claiming to be the dead Dimitri. Conflicts between aspirants for the crown continued until 1613, when a large number of nobles offered the throne to the king of Poland. A sentiment was aroused against this, and the Russian army drove the Poles from Moscow. They then determined to elect a czar. A council, composed of nobles, clergy and burgesses assembled in Lent of 1613. After several days of strong debate the choice fell to Michael Romanoff, a member of a distinguished though not royal Prussian family in Moscow. He was crowned in April of the same year and reigned for 32 years. His successors in the male line ruled until the death of Peter II in 1730, when the succession reverted to the female line. Another change took place with the death of Elizabeth in 1762, when her nephew, the son of the Duke of Holstein-Gottorp, a branch of the House of Oldenburg, succeeded to the throne with the title of Peter III, thus founding the House of Romanoff-Oldenburg to which the last of the Czars Nicholas belonged. With the fall of the Empire, he was imprisoned, exiled to Siberia and reported assassinated by the Bolsheviki (q.v.).

Rome, Ga., county-seat of Floyd County, on Coosa River, 61 miles northwest of Atlanta. It has iron-foundries and manufactories of plows and nails, and ships cotton.

It is the seat of Shorter College. Population 12,099.

Rome. Modern Rome occupies the plain on each side of the Tiber (about 15 miles from the mouth) and the slopes of seven hills, the central one of which was the Palatine hill, whose summit is about 160 feet above the sea. These gave Rome the name of the City of the Seven Hills. Romulus is said to have founded the city upon the Palatine, and upon its northwestern slope grew the sacred fig, under which he and his brother Remus were found sucking the she-wolf. Upon this hill were the temple of Jupiter Stator and other sacred buildings, besides many of the finest houses in Rome. Recent excavations have brought to light numerous remains of the palatial and other structures with which the Palatine was once covered, and these are among the most interesting remains of the Eternal City. The Palatine was fortified at a very early period, and in the time of the later or Etruscan kings at least five of the hills had been surrounded by separate defenses. These fortified hills with the marshy hollows between them were then enclosed by a huge rampart or *agger* of earth. This *agger* formed the only defense until the reign of Aurelian 800 years later, and the great wall which bears the name of Aurelian is to a great extent identical with the present walls. To the period of the kings belongs the huge, arched sewer which drains the marshy hollow between the Capitoline, Palatine and Esquiline hills. In this valley was situated the Forum, containing about two and one half acres, which became both the market and the place of political meeting for the tribes that occupied the surrounding hills.


Circus of Hadrian
Vatican Hill
St. Peter's (Modern)
Circus of Nero
Tomb of Hadrian
R. Tiber
Tomb of Augustus
Gardens
Mt. Pincius
Via Salaria
Via Nomentana
Arch of Aurelius
Campus Martius
Circus
Bath
Pantheon
Quirinal Hill
Gardens of Sallust
Baths of Diocletian
Viminal
Hill
Esquiline
Wall of Aurelian
Via Tiburtina
Capitoline
Temp of Juno
Baths of Titus
Gardens
Reservoir
Temp of Hercules
Via Aurelia
River Tiber
Janiculum
Modern Wall
Palatine Hill
Aqueduct
Cæsar's Garden
Aventine Hill
Circus Maximus
Cælian Hill
Aqua Claudia
Amphitheatre
Campagna
Baths of Antoninus
Via Ostiensis
Monuments
0 500 1000 Yards
REFERENCES.
1. Temple of Aurelius.
2. Amphitheatre.
3. Hall of Neptune.
4. Isium and Serapium.
5. Temple of Minerva.
6. Campus Agrippæ.
7. Temple of Apollo.
8. Temple of Trajan.
9. Basilica Ulpia.
10. Forum of Trajan.
11. Forum of Augustus.
12. Forum of Vespasian.
13. Basilica of Constantine.
14. Temple of Rome.
15. House of Nero.
16. House of Domitian.
17. House of Augustus.
18. Hall of Julia—Law Court.
19. Asylum.
20. Capitol.
21. Theatre of Marcellus.
22. Theatre of Pompey.
23. Diribitorium.
24. Septa Julia.

Plan of ANCIENT ROME, showing the position of The Principal Buildings.

In the great aqueducts we have the most notable remains of the period of the republic. The oldest was that constructed by Appius Claudius Cæcus in 312 B. C., which brought water from springs more than seven miles away. Other aqueducts were constructed during the imperial period. These aqueducts, 14 in number, have an aggregate length of over 300 miles and are among the most striking features of modern Rome. Of the numerous temples in Rome, of which there are said to have been as many as 300, the names and sites of about half are known, the preservation of the few which remain being due to their having been converted into churches.

The *Thermæ* of Agrippa, of which the Pantheon is the only portion that remains, were the earliest of the great public baths for which imperial Rome was noted. On the low grounds at the south of the Cœlian hill were the baths of Caracalla, which were built to accommodate 1,600 bathers. The outer walls enclosed nearly 27 acres, the baths themselves occupying nearly one fourth of this space.

A large marshy plain, which now forms the most densely populated part of Rome, extended from the Capitoline, Pincian and Quirinal hills to the Tiber, which, on account of being used for military exercises, was called *Campus Martius*. Here was erected the theater of Pompey, which is said to have contained seats for 40,000 persons. *Campus Martius* was the most famous of the eight *campi* or public parks of ancient Rome. It lay outside the walls. Originally a place for military exercises and contests and for the assemblings of the people, it later became a suburban pleasure-ground and was laid out with gardens, walks, baths, a race-course and theaters. Marble halls were built there by Julius Cæsar, public baths and the Pantheon by Agrippa, the Egyptian obelisk and his own splendid tomb by Augustus. Here also was built the first amphitheater of stone. Later the *Campus Martius* became crowded with public buildings and private dwellings, and was inclosed within the city boundaries. Near the capitol was the theater of Marcellus, of which a considerable portion yet remains. This was begun by Julius Cæsar and finished by Augustus in 11 B. C., who named it after his nephew. The Flavian amphitheater, known as the Colosseum, which was built for gladiatorial exhibitions and the combats of wild beasts, is an ellipse, the longer diameter measuring a little over 600 feet and the shorter a little over 500. It rises 160 feet, and covers five acres. The oldest circus was *Circus Maximus* in the valley between the Palatine and Aventine hills, which was about three furlongs in length and one in breadth, and is said to have seated 250,000 persons. The arrangements of a Roman circus can best be studied in the well-preserved circus on the Appian Way, which usually bears the name of Emperor Maxentius but is more correctly assigned to Romulus, his son. Of the 12 bridges over the Tiber three are survivals of the eight or nine bridges of ancient times, the oldest being *Pons Fabricius*, leading from the city to the island in the Tiber.

The population in the time of Vespasian has been estimated at 2,000,000, but it is extremely doubtful if it ever exceeded 1,000,000. The walls, which enclose nearly 4,000 acres, are 14 miles in circumference, with 15 gates, two of which are closed. The largest palaces are the Vatican, the residence of the pope, and the Quirinal, the residence of the king, formerly a papal palace, in which were held the conclaves of cardinals for the election of popes. The chief papal collections are contained in the galleries attached to the Vatican, probably the largest palace in the world. In addition to the private gardens and apartments of the pope, the Vatican comprises large reception-halls, with chapels, libraries, picture-galleries and vast museums of sculptures, ancient inscriptions and other antiquities. The famous Vatican Library, with its priceless manuscripts and collections of early printed books, occupies two immense halls.

The churches, said to number upward of 300, are among the most conspicuous features of modern Rome. St. Peter's, the largest cathedral in the world, begun in 1506 and completed in 1626, covers five acres and cost $10,000,000. There also are churches of the great religious orders, 28 parish churches and titular churches of the cardinals. Before Rome became the capital of Italy in 1870, the greater part of the Pincian, Quirinal and Esquiline hills was occupied by villas of nobles; but these have mostly been destroyed and their sites covered with modern houses, in many cases with blocks of buildings many stories in height, let out in tenements. The ancient city is assuming the aspect of a modern capital, broad, straight thoroughfares running through many quarters formerly occupied by narrow streets and mean, crowded houses. The seven hills, as such, have almost ceased to exist. One of the greatest of improvements is the embankment of the Tiber and the straightening and deepening of its channel, which ended the disastrous floods to which the lower parts of the city were formerly subject. All the necessaries of life have to be imported from a distance, as Rome is surrounded by the *Campagna di Roma* (*q. v.*), a marshy plain which includes the greater part of ancient Latium and, for the most part, is an untilled and uninhabited waste, about 90 miles in length and from 20 to 40 in width. Corn and wine are brought from Tuscany and from the fertile *Terra di Lavoro* near Naples. There are practically no manufactures; and the prosperity of the city depends mainly on the courts of the king and the pope and on the foreign visitors who crowd the hotels during the winter. The railways from all parts of Italy converge outside the city, which they enter near *Porta Maggiore* on the Esquiline, having a common terminus on the summit of the Quirinal. See ROMAN EMPIRE. See Vernon Lee's *The Spirit of Rome*, Hare's *Walks in Rome*, Mommsen's *Rome* and Crawford's *Ave Roma Immortalis*. Population of the city 538,634; of the district 1,298,142.

Rome, N. Y., a city, county-seat of Oneida County on Mohawk River, 100 miles west of Albany, at the junction of the Barge and Black River Canals. It contains mills and manufactories of iron, brass, copper, furniture, machinery, saddlery, wire and other goods. Rome has admirable public schools, St. Peter's Academy (R. C.), two libraries and several churches. The city has all the improvements of a progressive city and the service of two railroads. Here is Fort Stanwix, which was successfully defended against St. Leger, and six miles to the southeast the battle of Oriskany was fought during the Revolution. Population 32,000.

Ro'meo and Ju'liet, a drama by William Shakespeare, written sometime between 1591 and 1596, first published in 1597. The legend upon which it is founded first appeared in Naples in 1476. It appeared in English in 1562 in *The Tragicall Historye of Romeo and Juliet* by Arthur Brooke, which furnished the main foundation for this drama. The legend has often been chosen for operatic purposes. The best opera based upon it is that by Gounod, which first appeared in 1867.

Rom'ola, one of the best of the novels of George Eliot, first published in serial form in the *Cornhill Magazine*, 1862–3, deals with Italian life in the period of the famous Savonarola. It was a period of political as well as religious crisis, for the French were intriguing against the power of the Medici. Savonarola threw his whole weight on the side of Christian simplicity in the reaction against the artistic paganism which the Medici had encouraged. The most notable character in the book is Tito Melema, the handsome but false Greek. Tito wins the hand of Romola, who is the daughter of a blind scholar named Bardi. He plays her false and dies. Meantime Romola's better self, that which is swayed by the spirit of Savonarola and not the Medici, is triumphant, and she devotes her life to love and charity.

Röntgen (*rûnt′gĕn* or *rĕnt′gĕn*), **Wilhelm Konrad,** a German physicist, was born at Lennep in Rhenish Prussia, in 1845. Thirty years later, he became professor of physics and mathematics at the Agricultural Academy of Hohenheim, near Stuttgart. He accepted a similar position in Strassburg in 1876. In 1879, Röntgen became professor of physics and Director of the Physical Institute in Giessen, and in 1885 was appointed to the similar chair in Würzburg. In November, 1895, he appeared before the Physico-Medical Society of that city and read a paper upon the discovery of the "X" or Röntgen rays. For this valuable discovery, he was awarded many honors, including the Rumford Medal of the Royal Society of London in 1896, and the Barnard medal of Columbia University, New York, in 1900, for the greatest discovery in science during the preceding five years. In 1901 he received the Nobel prize for physics. In addition to this discovery, Röntgen did much valuable research in electricity, conductivity for the heat of crystals, specific heats and absorption of the heat of gases, and magnetic rotation of polarized light. He published many articles on physics, chiefly in the *Annalen der Physik und Chemie.* Röntgen died in 1923.

Rondeau (*rŏn′dō* or *rŏn-dō′*), or **Rondel** (*rŏn′dĕl*), a lyric form closely resembling the sonnet. It consists of thirteen iambic lines, which are arranged in three strophes of five, three and five lines, generally of ten or eight syllables each. There are only two rhymes. The opening words of the first line are added, as a refrain, after the eighth and thirteenth lines. The form originated in France.

Rondo, an early instrumental form; or the musical setting of a rondeau. In the individual rondo, there was a principal theme, with several subsidiary or contrasting themes. The principal theme was repeated in its original key after each subordinate theme. It is often used as a movement of the sonata. In the earlier forms, the rondo seldom contained more than two themes, but Mozart and Beethoven introduced three, and used the second and third in new keys whenever they reappeared. They developed and varied the rondo greatly. Later composers have followed in their footsteps.

Romulus (*rŏm′ū-lŭs*), the legendary founder and first king of Rome, was a son of Mars by Rhea Silvia, daughter of King Numitor of Alba Longa. According to the myth he was exposed with Remus, his twin-brother, at the foot of the Palatine Hill, where he was suckled by a she-wolf, and afterward brought up by the shepherd Faustulus and his wife, Acca Laurentia. In 753 B. C. he founded his city on the Tiber, to which he invited all homeless fugitives in the surrounding country. They carried off Sabine maidens for their wives. After Romulus had firmly established his city and secured peace between the Romans and the Sabines, he was carried to heaven in a chariot of fire and later was worshipped as Quirinus.

Roof (*ro͞of*), the upper and exterior covering of a building. In dry countries, such as Egypt, the roof is flat; it is sloped in most countries, however, in order that it may shed water in the rains. In earlier buildings the roof was supported on wooden beams, but the great temples of Egypt used long monoliths as beams. Large roofs framed in timber were used in the Greek and Roman temples, and later, the arch and dome, of which the Pantheon is one of the finest examples. The ordinary types of roof include the gabled, in which two slopes meet in a horizontal ridge and terminate in triangular gables or pediments; the hipped, in which four sloped surfaces rise from the four walls to a short central ridge; the gambrel, with a double slope on either side, which is steep in the lower part and flatter in the upper; and the mansard, a combination of the hipped and the gambrel, with the upper slope almost flat. Other less common roofs are shaped like pyramids, cones, or domes. The roof may be covered with almost any waterproof material. Wooden shingles, metal or terra-cotta tiles, slates, zinc, copper, lead, and even tar, thatch and canvas, are used as roofing.

Rook, an old world bird belonging to the crow family. It is slightly smaller than the common crow. Its plummage is purplish black, with gray on the forehead and throat. The adults lose the feathers on the face, leaving a bare spot about the bill. These birds live in noisy flocks and nest near habitations. They are common in many parts of Europe and Asia, and in late autumn migrate to the east shore of Great Britain and return in the spring.

Roosevelt, Anna Eleanor (Mrs. Franklin Delano Roosevelt), First Lady of the Land, was born in New York City on October 11, 1884, the daughter of Elliott and Anna Hall Roosevelt. She was educated in private schools in the United States and Europe. Even as a young girl, Mrs. Roosevelt displayed a keen interest in social service and educational work. On March 17, 1905, she was married to Franklin Delano Roosevelt, a distant cousin. Her interest in sociological and educational activities has never flagged and her action has ever been dominated by an attitude of simplicity and natural assurance, inherent qualities of a true aristocrat. In addition to her many interests in the welfare of humankind, Mrs. Roosevelt successfully attended to her responsibilities as a mother of five children, one daughter and four sons, at her home in Hyde Park, Dutchess County, New York. In her each and every task, whether it has been for her family, in social service work, teaching, editing, or in the supervision of the handicraft furniture plant, she has won for herself a reputation of "boundless energy" and perseverance, qualities which were so characteristic of her famous uncle, Theodore Roosevelt.

From 1924-28 she was finance chairman of the woman's division of the New York Democratic State Committee. In 1928 she was a member of the advisory committee in charge of women's activities of the Democratic National Campaign Committee. Mrs. Roosevelt is vice president of the Val Kill Shop and vice principal of the Todhunter School of New York City. After the election of Franklin D. Roosevelt to the presidency of the United States, Mrs. Roosevelt was obliged to give up many of her responsibilities temporarily, in order to fulfill her duties as the First Lady of the Land, an exalted position which her patience, kindness, social and personal charm enable her to hold with a "queenly graciousness."

In March, 1934, Mrs. Roosevelt visited Puerto Rico where she was greeted by enthusiastic throngs wherever she appeared. Here she was particularly interested in the factories and visited the needlework district where the workers are poorly paid for their handwork. Although Mrs. Roosevelt's visit to the island was a decidedly informal one in which she glimpsed much of Puerto Rican life which fascinated her, the journey was in reality undertaken with the intention of conducting a thorough investigation of working conditions and conferring with social workers on the island. Her travels are but one phase of her busy life. She meets each problem confronting her and pursues each activity with a confidence, courage, kindness and sincerity which ever dominate her charming personality.

Roosevelt (*rō′z′-vĕlt*), **Franklin Delano,** the thirty-first President of the United States. On November 8, 1932, almost twenty-three million voters accorded him the largest popular vote ever given a candidate for this high office. In so doing, they chose a new, and yet an old, type of chief executive for the nation; new when compared with those who had held the office in the years since the World War, old when compared with the occupants of this position in the early days of the Republic. The story of his life is no chronicle of a rise from log cabin to White House. He is no Jackson; no Lincoln. Here is the scholarly patrician, the born gentleman. Of this type were Washington, Adams, Jefferson, Madison, Monroe.

Franklin Delano Roosevelt was born on January 30, 1882, at Krum Elbow, the Roosevelt family home, near Hyde Park, New York. He came of a family long prominent in the affairs of the state and nation. His father was James Roosevelt. His mother, Sarah Delano Roosevelt, came of a family equally distinguished. Franklin was the one son of this union. His parents were very fond of him, and in order to have him with them as much as possible, had him educated by private tutors until he was fourteen years old. He accompanied his parents on various trips abroad, and received many advantages not accorded less fortunate children. When he was fourteen, he was sent to the Groton School, Groton, Connecticut. Here he took an active part in school life and athletics, and served as student manager of the baseball team. He also became a strong swimmer.

After finishing his course at Groton, Roosevelt entered Harvard University. Here he became imbued with that breadth of vision, that absence of bigotry, that tolerance, which was to distinguish him so much in later years. Harvard conferred the degree of Bachelor of Arts on him in 1904. His high scholarship also brought him membership in Phi Beta Kappa, the honorary fraternity. He next attended the Law School of Columbia University, from which he graduated in 1907. He was then admitted to the New York bar.

Two years before he was graduated from the law school, Roosevelt was married to his sixth cousin, Anna Eleanor Roosevelt. Her father was the late Elliot Roosevelt, younger brother of President Theodore Roosevelt. The latter came to New York for the ceremony and gave his niece in marriage to his distant kinsman.

Almost immediately after he had begun his career, Roosevelt showed his fondness for public life. In 1910 he ran for election to the State Senate from Dutchess County. The district was normally Republican, but Roosevelt won the election as a Democrat. At Albany, he earned a reputation as a fearless opponent of Tammany Hall, the great Democratic organization of New York City. He was successful in this opposition.

When Woodrow Wilson became President of the United States, Franklin D. Roosevelt was appointed Assistant Secretary of the Navy. He resigned from the New York Senate to take his new position. In the ensuing years, he had ample opportunity to exercise the fondness for the sea which had ever been a part of his nature. His duties were increased enormously when the United States entered the World War. He undertook his greater task with dauntless courage and efficient energy, and made an excellent record for himself. In 1918 he had charge of an inspection of American naval forces in European waters. In January and February, 1919, he supervised the demobilization of American naval units in Europe.

Long before the end of the World War, Roosevelt had been recognized as a future leader of the Democratic party. His distinguished name and his keen political sense made him so. In 1920 he was nominated for Vice President of the United States at the Democratic National Convention in San Francisco. He and the Democratic candidate for President, Governor James M. Cox of Ohio, made a strenuous campaign, but they were defeated. He took this defeat philosophically as one of the fortunes of political life. He knew that another day would come on which he would receive the smiles of Fortune. He did not know, however, that before that time did come he would be tested and tried by a calamity that would have overwhelmed a lesser man.

In 1921 Roosevelt was vacationing at Campo Bello, Canada, when the dread disease, infantile paralysis, crept upon him and struck him down. His brilliant mind was as keen and eager as ever, but from the hips down his body was palsied. Confined to a wheel chair, some thought he had finished his political career. Of many men this would have been true, but Franklin D. Roosevelt could not stop. His keen mind, his dominant will would not let him. Health came first, however, and he undertook the long battle. By 1924 he was able to appear, at the cost of great physical effort, before the Democratic National Convention in New York City and make the nominating speech in behalf of Alfred E. Smith for President.

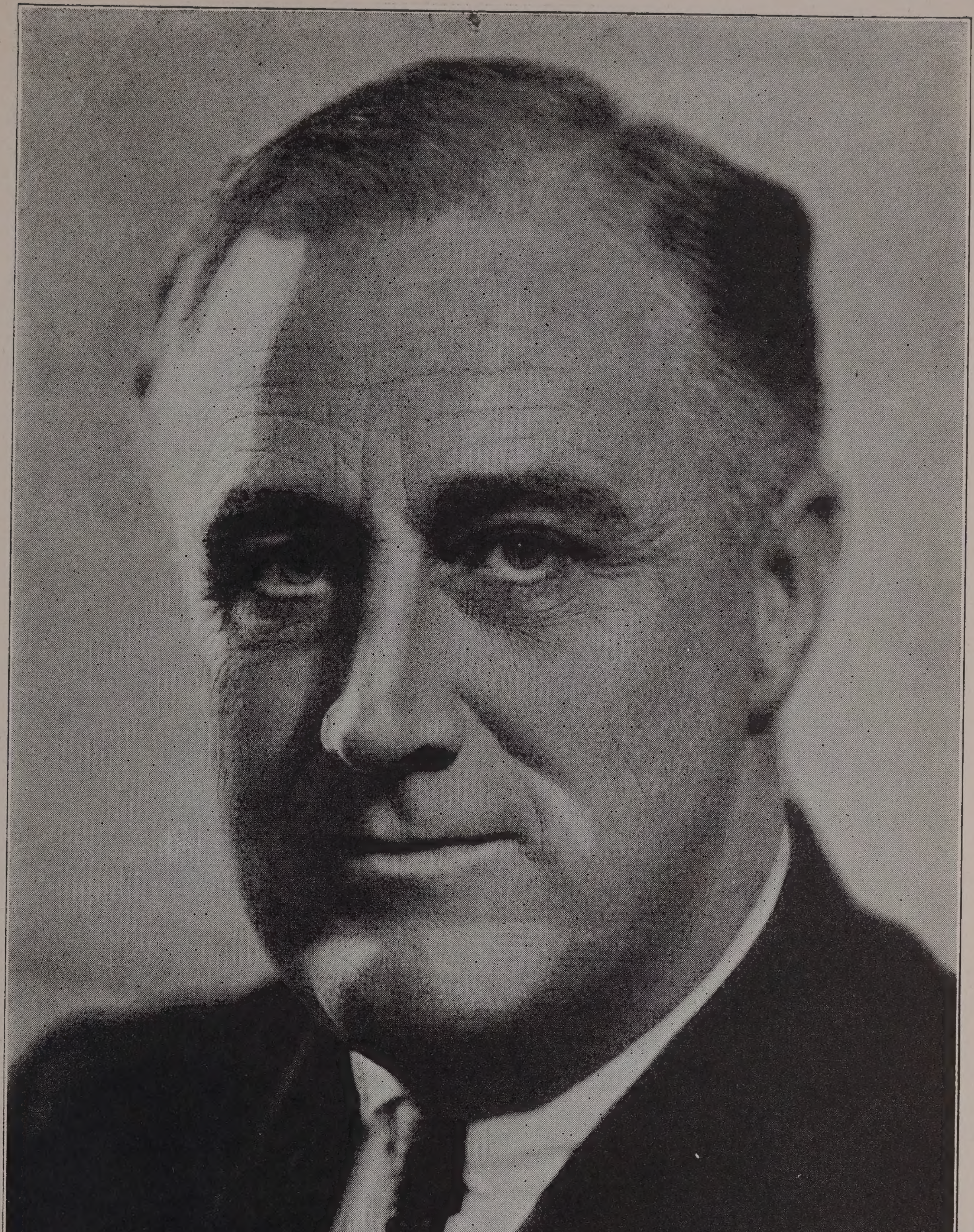
At about this time, Roosevelt learned of the remarkable curative effects of the baths at Warm Springs, Georgia. He decided to try them. These springs have a natural winter temperature of 99° Fahrenheit and possess certain radio-active properties. A paralytic can go through exercises immersed in water that are impossible otherwise. Immersion in ordinary water for any great length of time, however, tends to ennervate one, but the effect of these warm waters is practically the opposite. So, at Warm Springs, Roosevelt spent as much as six out of every twenty-four hours in the water. At first he could swim only with his arms, but gradually the use of his legs returned to him. Soon he was able to bear some of his weight on his legs when going about on crutches. He was winning his way back to health. In 1928 he was at Houston to place the name of "Al" Smith before the Democratic Convention and to term him the "Happy Warrior." He then went to Warm Springs to continue his efforts for physical strength.

While Roosevelt was at Warm Springs, the New York State Democratic Convention was in session. He was urged to accept the nomination for governor. He protested that his health would not permit it. Governor Smith telephoned him from New York, and at last prevailed upon him to accept the nomination. Smith failed to carry New York for President, but Roosevelt was elected governor. Two years later he was re-elected by the greatest plurality ever given a governor up to that time, a plurality of over 725,000 votes. His excellent record as governor of this great state led naturally to his being considered as a candidate for the Presidency. His progressive attitude in regard to water power, forestation, agriculture, and labor brought him the support of the forward-looking elements in both the Democratic and the Republican parties. Likewise, it earned him the dislike of the conservatives and so-called "standpatters" of each party. There was one man determined that Roosevelt should be President. James A. Farley, of the New York State Boxing Commission, set out to make him the Democratic nominee. He succeeded. Roosevelt was nominated for President on the fourth roll call at the Democratic National Convention in Chicago.

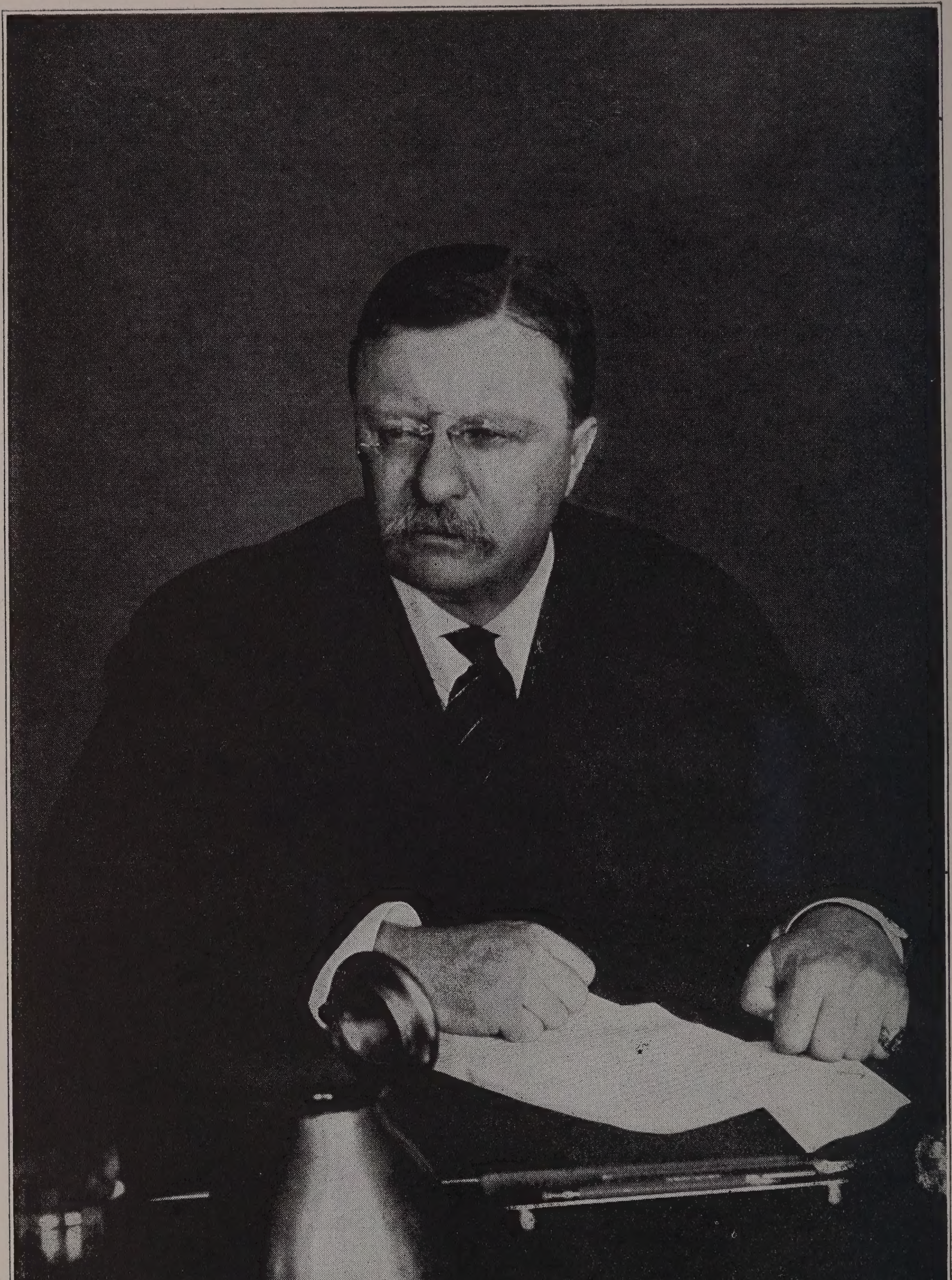
In accordance with the Roosevelt tradition, the Presidential candidate immediately began to break precedents. He chartered an airplane, was flown to Chicago, and delivered his speech of acceptance to the Convention which had nominated him just nineteen hours previously. He had prepared the speech while making the trip. His short sentences, simple English, and definite statements showed the accuracy of his mental processes. He there and then assumed the offensive in the campaign, and he never receded from this attitude. A great majority of the voters recognized him as their leader.

In the interim between Roosevelt's election and his inauguration, the economic condition of the country went from bad to worse. On the day that Herbert Hoover gave up the Presidency, the nation was in the throes of a bank depositors' panic, which had caused the closing of the banks in almost every state. All eyes were turned to Washington, awaiting action by the new President. They did not wait for long. Roosevelt's great inaugural address filled the font of confidence that had become so low. On March 5 he issued an executive order declaring a national banking holiday for four days. He also called Congress to meet in special session on March 9. He and his advisers prepared an emergency banking measure, which was awaiting the legislators when they convened. It was passed by both Houses, delivered to the President, and signed on that very day. Four days later sound banks were permitted to resume business.

Then came the famous "one hundred days," in which the Congress passed more far-reaching legislation than had ever been enacted under the administration of one President in the nation's history. In the meantime, the President had announced the appointment of a Cabinet of outstanding men and one woman. (See CABINET.) In his campaign for election, the President had promised legalized beer for the states desiring it. This



Franklin D Roosevelt



THEODORE ROOSEVELT

was an accomplished fact on April 7, 1933. He had promised to reduce the cost of government and to balance the regular budget. Government costs were greatly reduced and within a few weeks after he took office it appeared likely that the regular budget would be balanced for the fiscal year ending June 30, 1934. For over ten years there had been much talk of relief for the farmers. A law was enacted which included a number of alternative measures and left the application of the most appropriate ones to the discretion of the administrators of the law. The unemployment situation was recognized as the greatest obstacle to a restoration of prosperity. To meet this situation and to increase wages in accordance with rising commodity prices, the National Industrial Recovery Act was passed. Under this law, the National Recovery Administration (NRA) was set up, under General Hugh S. Johnson. Because of the banking crisis, the United States was forced to suspend gold payments, and on June 5 the President signed a law definitely putting the country off the gold standard. He had previously been given complete control over the nation's monetary policies by the amendment to the Act for farmer relief. Under these powers he determined to set the value of the dollar by the purchase of gold through the Reconstruction Finance Corporation, rather than to let European nations manipulate American currency to their own advantage. (See GOLD STANDARD.) Under the public works section of the National Industrial Recovery Act, Roosevelt was given almost unlimited discretion in the spending of $3,000,000,000 in a program of public works intended to give work to the unemployed. He placed Secretary of the Interior Ickes in charge of the Public Works Administration. By the beginning of 1934, marked improvement was apparent in all lines of business. While conservatives were voicing loud opposition to the President's policies, he and his advisers were going forward without hesitation to give the nation the "New Deal" which he had promised.

See GOLD STANDARD; UNITED STATES, subhead *History*.

Roosevelt *(rō′z′-vĕlt)*, **Theodore,** the twenty-fifth man to serve as President of the United States. When Woodrow Wilson was asked why he never seemed to lose admiration for Theodore Roosevelt, although the latter bitterly opposed many of his policies, Wilson said, "Because he is sincere." Sincerity and forcefulness were two of the outstanding characteristics of this great American. He endeared himself to the American people by his strenuous devotion to their interests and to the public interests of his country.

Theodore Roosevelt was born in New York City on October 27, 1858. He was not robust as a child, and received the greater part of his elementary education from private tutors. He came of an old Dutch Knickerbocker family, which had long been prominent in the affairs of the state and the nation. He graduated from Harvard University in 1880. After a visit to Europe, he was elected to the New York State legislature. He promptly became prominent and although the youngest man in the body, he became Republican leader. He then went to South Dakota to build up his health and engaged in the cattle business. Upon his return to New York City, he was made Civil Service Commissioner in 1889, and in 1895 he became president of the Police Commission of New York City. He served with distinction, achieving many notable reforms.

Roosevelt became assistant-secretary of the navy in the Cabinet of President McKinley. Shortly after the outbreak of the Spanish-American War, he resigned and with Leonard Wood organized the 1st United States Cavalry Volunteers, which were popularly known as the "Rough Riders." Wood was colonel of the regiment and Roosevelt was lieutenant-colonel. Wood was later promoted brigadier-general, and Roosevelt became colonel, commanding the Rough Riders. He rendered notable service at Las Guasimas, at El Caney, and at San Juan Hill.

In 1898 he was elected governor of New York state on the Republican ticket. In order, as they thought, to dispose of him, the conservative Republicans nominated him for Vice President on the ticket with McKinley in 1900. The assassination of McKinley caused Roosevelt to become President. In 1904 he was elected President by an overwhelming majority. In the Presidency, he displayed the same executive ability and devotion to public service which had characterized his previous career.

In 1912 he was nominated for President by the Progressive Party, which he helped to form (see TAFT). Although defeated by the Democratic candidate, Woodrow Wilson, he polled a large vote, second only to that of Mr. Wilson and its leaders announced that the organization of the party would be made permanent. A dramtic feature of the campaign was the attempt on the life of Roosevelt at Milwaukee by an insane man, as a result of which Wisconsin passed a law providing thirty years imprisonment for attempts to kill a presidential candidate.

Among the important features of his administration were: Prosecution of corporations accused of violating federal laws; securing of the Panama canal-zone by the United States (see PANAMA CANAL); establishment of civil government and opening of public schools in the Philippines; the establishment of agricultural and other bureaus for the development of their rich resources, the meeting of the first Filipino legislature in 1908; the creation of the Department of Commerce and Labor; commercial treaties with Cuba and China; the mediation of President Roosevelt between Russia and Japan, thus ending the war; the settlement with Great Britain of the Alaskan boundary; the completion of the Pacific cable to the Philippines; the Cuban revolution; the pacification of the island under American occupation and its restoration to the newly organized republic in 1909; the passage of the pure-food bill and the railroad-rate bill, the admission of Oklahoma into the Union. After the close of his term as president, Roosevelt spent a year hunting in Africa. In 1916 he declined the Progressive nomination; then, with many Progressives, vigorously supported Hughes, the Republican candidate. During the World War, Roosevelt was anxious to lead a regiment overseas, but because of his age and the precedent such a procedure would have established, he was denied this privilege. At one time, Roosevelt expected to make literature his life work. For some time after his return from Africa in 1910 he was associate editor of the *Outlook*. Among his writings are: *The Winning of the West; American Ideals; The Rough Riders; Life of Gouverneur Morris; Life of T. H. Benton; History of the Naval War of* 1812; *Life of Oliver Cromwell; The Strenuous Life; The Wilderness-Hunter; Hunting the Grizzly,* and *Hunting Trips of a Ranchman.* He died January 6, 1919.

Root, in botany, a portion of the plant body of higher plants (ferns and seed plants) bearing neither leaves nor reproductive organs, but having an apical growing point and functioning as an organ of absorption, an aërating organ, a food reservoir, or a means of mechanical support. The ordinary soil-roots serve both for anchorage and for absorbing. In structure, roots are all alike in general plan, whether they belong to ferns or to pines or to the true flowering plants. Each root consists of an epidermis, a more or less thick cortex, and a central, solid, woody cylinder or axis. In the soil-roots a peculiar cap of dead cells covers the delicate growing tip, known as the root-cap. This cap protects the delicate tip-cells as the root burrows through the soil, and it is renewed from beneath as fast as it is worn off on the outside. To aid roots in absorbing, the epidermal cells just behind the root-cap send out long hair-like processes known as root-hairs, which immediately increase the absorbing surface. These root hairs are ephemeral, being present only near growing tips and rapidly disappearing from older parts. It is only the youngest roots which have this typical root structure and do the work of absorption. As a root increases in age, it becomes very much modified in structure and ceases to absorb, being then merely a channel through which the absorbed material passes.

Root, Elihu, an American lawyer and statesman, was born at Clinton, New York, February 15, 1845. He graduated from Hamilton College in 1864. Two years later he graduated from the Law School of New York University, and immediately began practice in New York City. A Republican in politics, he was U. S. district attorney at New York City from 1883 to 1885. He was Secretary of War, 1899-1904, resigning in the latter year to resume the practice of law. He planned the new War College at Washington, modified the rules of promotion of officers, and instituted the general staff in the United States Army. On July 19, 1905, President Roosevelt appointed Root his Secretary of State. In July, 1906, he distinguished himself as the U. S. representative at the Pan-American Congress at Rio de Janeiro.

In 1909, Root resigned as Secretary of State and was elected U. S. Senator from New York State. In 1910 he served as counsel for the United States in the North Atlantic Fisheries Arbitration. He also became a member of the Permanent Court of Arbitration, and president of the Carnegie Endowment for International Peace. He was awarded the Nobel Peace Prize in 1912.

Root was permanent chairman of the Republican Convention at Chicago in 1912, and ardently supported President Taft for renomination and later for re-election. In 1916 he received 103 votes for nomination as President, but refused to allow himself to be seriously considered for the office. In 1915 he was president of the American Bar Association. He was president of the convention at Albany in 1915 which remodelled the Constitution of the State of New York.

In 1917 Root was sent to Russia by President Wilson as ambassador extraordinary at the head of a special diplomatic commission. He was a member of the commission of international jurists, which, on invitation of the League of Nations, drafted a plan for the establishment of the Permanent Court of International Justice. He served as commissioner plenipotentiary for the United States at the Conference on Limitation of Armament in Washington.

Root hoped that the United States would adhere to the World Court. After other nations refused to accept the reservations provided by the United States Senate in 1926, he turned to it again and devised what is known as the Root Formula. This formula was the basis for revision of the protocol of the World Court which was adopted as revised in 1929. Sooner or later it appeared likely that the United States would adhere to the Court under this arrangement.

Root, George Frederick, an American musical composer, was born at Sheffield, Mass., Aug. 30, 1820. After studying music a year in Paris, he returned to write numerous popular songs, among which are *Music in the Air; Battle-Cry of Freedom; Just before the Battle, Mother; Tramp, Tramp Tramp, the Boys are Marching.* He also produced a *Te Deum* and other more pretentious pieces including the cantatas *Daniel* (1852); *The Pilgrim Fathers* (1854); and *Belshazzar's Feast* (1856). He received the doctorate from Chicago University in 1892. He died on August 6, 1895.

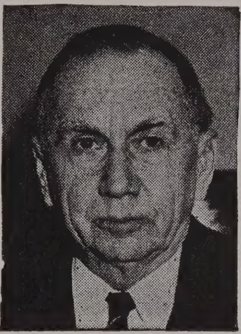
Root-Hair. See Root.

Root-Pressure. When plants have their roots in a warm soil and the parts in air are not losing much water (whether because the leaves are not yet formed or because the moisture or coolness of the air do not permit evaporation), the roots may absorb water so rapidly that it distends the cells and escapes into the conducting tissues under the elastic pressure of the stretched cell-walls. By this pressure it may be driven through the conducting tissues to some distance above the ground, and may well out at a wound. Late-pruned grape-vines "bleed" in this way, and much of the so-called dew on a lawn is water which has exuded from the leaves on account of root-pressure. Many leaves have special openings called water-pores which permit the escape of water at times. But when evaporation is rapid, root-pressure falls to zero or becomes negative; while, therefore, it may assist in supplying water to leaves, it fails when the need is the greatest, and cannot be an important agent in the ascent of water. See Water, Ascent of.

Rootstock or **Rhizome** (*rī'zōm*), an underground stem, usually horizontal and much thickened by the storage of reserve food. That the structure is a stem may be recognized by the fact that it often bears reduced leaves. It actually is the primary shoot of the plant, and sends out its branches or leaves above ground.

Root-Tubercles (*tū'bẽr-k'ls*), little wart-like outgrowths frequently occur, known as root-tubercles, on the roots of many leguminous plants, as the clovers. It is evident that these are occupied by bacteria, which swarm in them and doubtless obtain food from the roots of the host. These bacteria have the peculiar power of laying hold of the free nitrogen of the air circulating in the soil and of supplying it to the plant in some usable form. This habit of clover and its allies explains why they are useful in what is called restoring soil. After ordinary crops have exhausted the soil of its usable nitrogen salts and it has become relatively sterile, clover is able to grow by obtaining nitrogen from the air by the root-tubercles. If the crop of clover be plowed under, the nitrogenous material thus organized is contributed to the soil, restoring it to a condition which will support ordinary crops again.

Roper, Daniel Calhoun, an American statesman, lawyer and the Secretary of Commerce in the Franklin D. Roosevelt cabinet, was born in Marlboro County, South Carolina, on April 1, 1867. He was graduated from Trinity College, now Duke University, in 1888. He received an LLD degree from National University in 1901, and an honorary LLD from Tusculum College in 1927. He early showed an aptitude for figures, and became a wizard in their use. This ability led him into politics, where he became an active worker in the Democratic Party. He was a member of the House of Representatives in South Carolina from 1892 to 1894. His rapidity with figures secured for him the position of clerk of the Senate Committee on Interstate Commerce from 1894 to 1897. For the next ten years he was expert special agent for the United States Census Bureau. From 1910 to 1913, he served as clerk of the Ways and Means Committee of the House of Representatives. A short time later he was made First Assistant Postmaster-General, a post he occupied for three years. After a brief period in 1917 as vice-chairman of the United States Tariff Commission, he became Commissioner of Internal Revenue and served in that capacity until 1920.



Daniel C. Roper
Sec'y of Commerce

During all these years Daniel C. Roper called South Carolina his home, and maintained two plantations there. His work in the Democratic Party did not go unrewarded. He had taken a large part in the two campaigns which resulted in the election and reëlection of Woodrow Wilson to the Presidency. Consequently, in 1924, he managed the campaign of William Gibbs McAdoo for the nomination as President on the Democratic ticket. McAdoo, however, was dead-locked with Governor Alfred E. Smith, and the nomination was accorded John W. Davis. When McAdoo announced that the California delegation, instructed to vote for John M. Garner, would instead vote for Franklin D. Roosevelt as nominee, he began the stampede which resulted in the Roosevelt nomination and election. The consequence was the appointment of Daniel C. Roper as Secretary of Commerce, in an increasingly important department.

Ropes are usually made of vegetable fibers, and differ from twine only in their greater thickness. The fiber in most constant use is hemp, although ropes are also made of manila or wild plantain and of wire. Coir fiber from the husk of the coconut is another important rope-making material, which has the advantage of being lighter than either hemp or manila. Sisal hemp from South America is also used to a considerable extent, especially for ropes of small size, and for many purposes cotton ropes are also employed. Notwithstanding the extensive use of machinery in the manufacture of ropes, the old process of rope-walk spinning is still practiced on a considerable scale. The successive stages in this process are (1) hackling the fiber; (2) spinning the yarn; (3) tarring in "hauls," consisting of about 300 yarns; (4) winding the yarn on bobbins and mounting these on bobbin-frames; (5) forming the strands, and (6) laying the strands into a rope. As life and property depend to so great an extent on the efficiency of ropes, great care and ingenuity have been exercised in the manufacture, causing many improvements to be devised for increasing their strength. Among these is the introduction of wire-ropes, which are extensively used in rigging ships and for other purposes. These are generally made of iron wire, sometimes but not always galvanized. The twisting is done in the same way in which the strands of a hempen rope are laid together.

Roquefort (*rŏ̇k-fôr′* or *rōk′fôrt*), a town in southern France, is situated in the department of Aveyron. Since the time of ancient Rome, this little town has been famed for the cheeses produced there. The real Roquefort cheese is made from ewes' milk, both of sheep and goats. Occasionally a little cow's milk is added. The cheese is matured in grottoes, cellars and caves beneath the village. The result is a highly-flavored, blue-molded cheese considered a great delicacy. The population of Roquefort is about 1,200.

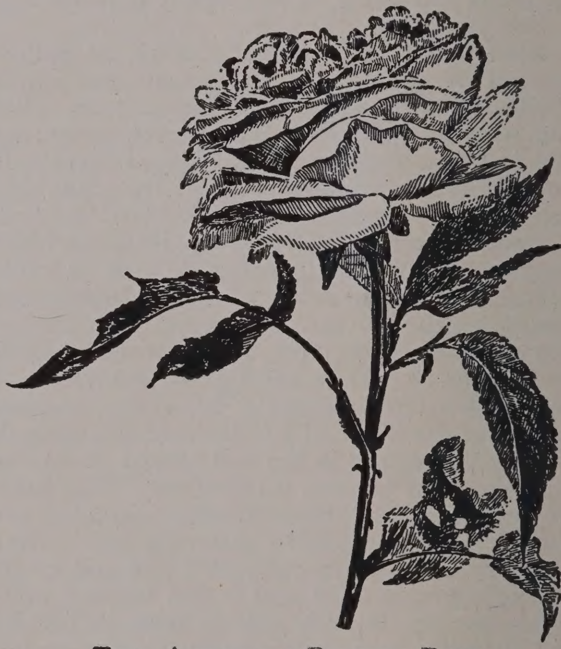
Rorqual (*rôr-kwăl′*), a whale of the family *Balænoptera,* which includes some of the largest whales. Because of the presence of a dorsal fin, it is sometimes called the "finback." Rorquals are whalebone whales, with a comparatively small head, a throat deeply furrowed and ridged lengthwise, and a short baleen. The northern rorqual or razorback is found in the Arctic seas. It is slate gray in color.

Rosa, Salvator, an Italian artist and poet, was born in Arenella, near Naples, Italy, in 1615. He studied painting under his brother-in-law, Francesco Fracanzano, and later under Falcone. The painter Lanfranco saw some of his landscapes and was so pleased with them that he encouraged the young artist to go to Rome in 1635. He very shortly came into favor with Cardinal Brancaccia, and spent the next three years alternately in Naples and Rome. He achieved fame with his *Tityus Tortured by the Vulture.* After 1639 he made his home in Rome, except for nine years in Florence between 1642 and 1651. He became particularly successful in battle scenes, marine views and landscapes. He was one of the advocates of wild landscapes, painting storms and tempests, gloomy caverns and forests, isolated castles and barren black rocks. His work helped to usher in romanticism and pessimism. He produced a number of excellent etchings and some brilliant verse satires. He died in 1673. Among his most famous pictures are *Conspiracy of Catiline; Prometheus; Jacob's Dream,* and *Saul and the Witch of Endor.*

Rosario (*rō̂-sä′rē̇-ō*), the second largest city of the Argentine Republic, is situated on the west bank of the Parana River, in the province of Santa Fe, 170 miles northwest of Buenos Aires. The city is the terminus of six railways, and an important river port. It is well-built, with wide streets, a number of beautiful parks, and many lovely homes. The Court House occupies an entire city square. Rosario has a handsome cathedral, excellent school buildings and a number of attractive structures in the business section. It is a thoroughly modern city, with electric street railways. The wharves, docks and warehouses are extensive and equipped with the most recent devices for handling the freight. Rosario carries on a heavy trade both in imports and exports. The city has grain elevators for storage. The chief exports include hides, wheat and other cattle and agricultural products, and metals and ores. The principal industrial plants include flour mills, large sugar refineries and breweries. Rosario has grown almost entirely during the last half-century. The population in 1931 was 485,354, a considerable increase over the population of 1922, which was 265,000.

Rosary, a string of beads used in prayers. A rosary consists of fifteen decades, each containing ten *Ave Marias* which are marked by small beads, preceded by a *Paternoster,* marked by a large bead, and concluded by a *Gloria Patri.*

Rose. The well-known name of the genus *Rosa* and the type of a great family of plants. It is one of the most prized of the cultivated ornamental forms, and is distributed over the whole temperate and subalpine region of the northern hemisphere. Over 200 species have been described, only about fifteen or twenty of which occur native to North America. The varieties in cultivation are almost innumerable, both those which are hardy and those adapted for culture under glass.

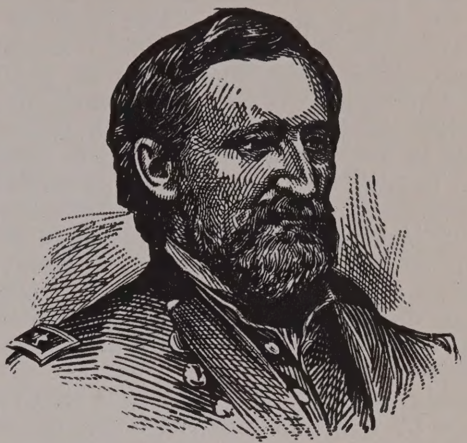


The American-Beauty Rose

The great beauty of the rose, its fragrance and its color have made it perhaps the most popular of all flowers, and yet it is one of the most difficult to cultivate in this country. It has been said that the garden-rose does not thrive in America as it does in Europe; yet under the skill of our horticulturists gratifying results have been secured. Hot sun and the frequent droughts that occur in our climate are the chief obstacles to the full development of the bloom. An authority says: "The rose-garden must not be in an exposed situation; it must have shelter, but it must not have shade. No boughs may darken, no drips may saturate, no roots may rob the rose. There must be a rich, strong soil of clay or loam, and the ground must be well-drained." It is by cultivation under glass in green-houses that the greatest success has been obtained. The great demand for choice roses has led to an enormous increase in the erection of commercial green-houses, especially near the large cities. There are so many obstacles to successful rose-culture, arising from climatic conditions, insect-enemies etc., that one of the many manuals issued should be consulted by anyone who undertakes the culture of this beautiful flower.

Rose'bery, Archibald Philip Primrose (Earl of), was born at London, May 7, 1847, and, after being educated at Oxford, succeeded his grandfather as fifth earl in 1868. In 1874 he was chosen president of the Social Science congress, and in 1880 was elected lord-rector of Edinburgh University. On public platforms throughout the country Lord Rosebery is welcomed as an effective and entertaining speaker, and, although a peer of the realm, enjoys in an unusual measure the good-will of the whole of the democracy. In 1886 Lord Rosebery became secretary for foreign affairs in Mr. Gladstone's cabinet. In 1894–95 he was prime minister. He is a strong imperialist, though a Liberal in politics. He has published *Napoleon Bonaparte* and *Sir Robert Peel*.

Rosecrans (*rō'zē-krănz*), **William Starke,** an American general, was born at Kingston, Delaware County, O., Sept. 6, 1819, and, after graduating at West Point in 1842, served in the army as an engineer until 1854. Being commissioned brigadier-general of volunteers in 1861, he rendered efficient service in McClellan's West Virginia campaign. When the latter was appointed commander of the army of the Potomac, Rosecrans was left in command in West Virginia. After the evacuation of Corinth by the Confederates in 1862, he was placed in command of the army of the Mississippi; and in this capacity defeated Gen. Sterling Price at Iuka on the 19th of September, and a few days later successfully defended Corinth against Price and Van Dorn. He was then made commander of the army of the Cumberland; and on the first and second days of January, 1863, fought the battle of Stone River, Tennessee, in which his army won a substantial victory, although with great loss; but at Chickamauga in the following September he was defeated by Bragg, with a loss of over 16,000 men, the army being saved from complete destruction by the heroic valor of Gen. George H. Thomas. Rosecrans was superseded by General Grant a short time after this battle, but in 1864 was placed over the department of Missouri and repelled Price's invasion of that state. He resigned his position in the army in 1867, and was appointed minister to Mexico by President Johnson in 1868, and was a member of Congress from California from 1881 to 1885. In the latter year he was appointed registrar of the United States treasury by President Cleveland. He died near Los Angeles, Cal., March 11, 1898.



GENERAL ROSECRANS

Ro'ses, Wars of the, a struggle between the houses of York (White Rose) and Lancaster (Red Rose), which desolated England from the battle of St. Albans in 1455 to that of Bosworth in 1485. The house of Lancaster came to the throne when Henry IV, son of John of Gaunt, compelled his cousin, Richard II, to resign the crown in his favor in 1399. Henry IV was succeeded by Henry V, his son, in 1413 and he by Henry VI, his son, in 1422; but during the reign of the latter Richard, duke of York, began to advance his claim to the throne. In 1454 Richard was appointed protector of the realm during Henry's insanity, and on the king's recovery soon after took up arms against his rival Somerset, and defeated and crushed him at the battle of St. Albans. But such was the weakness of Henry's administration and such the unpopularity of his queen (Margaret of Anjou), that the earls of Salisbury, Warwick and March rose against him, defeating and capturing him at Northampton in 1460. The active and ambitious queen passed swiftly to the north, and in the battle of Wakefield the duke of York was defeated and slain; but his son Edward gained decisive victories over the queen's forces at Mortimer's Cross and Towton (1461), after which he was crowned king at Westminster as Edward IV. A few years after Edward became king, the Earl of Warwick, who had been one of his most active adherents, took offense at his marriage with Elizabeth Woodville and formed an alliance with Queen Margaret, because of which Edward was compelled to leave England for a time, and Henry VI was once more invested with the royal authority. But Edward returned in 1471, defeated and slew Warwick at Barnet, and defeated the queen at Tewkesbury. The murder of Prince Edward, Henry's son, after the battle and the death of Henry himself in the Tower left Edward to reign in peace. He died in 1483, and was succeeded by his son Edward V, the unfortunate prince who, with his brother Arthur, was murdered in the Tower by order of his uncle Richard III. Richard's reign, however, was a short one, as he was defeated and slain at the battle of Bosworth in 1485 by the Earl of Richmond, who then became King Henry VII.

Rosetta Stone, a slab of black basalt discovered by a group of French engineers, in 1799, near Rosetta, a town on the delta of the Nile, and famous as having furnished the first key for the interpretation of Egyptian hieroglyphics. It is now located in the British Museum in London, England. Despite its present mutilated appearance, it has been judged that the slab was erected in honor of one of the Ptolemies in 196 B. C. On it are carved three equivalent inscriptions—the first in hieroglyphics (or picture-writing of a sacred character), the second in demotic (enchorial or epistolographic) characters, and the third in uncial Greek letters. The mutilations have destroyed a considerable portion of the inscriptions. In its present broken condition the stone measures three feet nine inches in height, two feet four and one half inches in width and eleven inches in thickness.

Rosin. See RESIN.

Roslin, a Midlothian Scottish village, is situated near the wooded glen of the North Esk, seven miles south of Edinburgh. Its castle was the seat of the St. Clairs, earls of Orkney from 1379 to 1471, afterwards earls of Caithness and hereditary grandmaster-masons of Scotland from 1471 to 1736. The exquisite chapel, built about 1446, was greatly damaged by an Edinburgh mob in 1688. It was restored by the third earl of Rosslyn at a cost of £5,000 ($25,000). Since 1862 it has been used as an Episcopal church. Its Spanish pillar is a marvel of beauty. On Roslin Moor the Scots are said to have twice defeated the English in one day on February 24, 1303.

Ross, George W., a Canadian statesman, was born in Middlesex County, Ontario, in 1841. He was educated at the Toronto Normal School and Albert University. He became a teacher and inspector of schools and was elected to the Canadian House of Commons in 1872. In 1883 he was elected to the Legislature of Ontario. He was appointed minister of education in 1883, and held this position until 1899. He became premier of Ontario in that year, accepting the portfolio of treasurer, which he resigned in 1905. Appointed to the Senate of Canada in 1906, he stands in the first rank of public men as debater and lecturer. He died in 1914. His works include *Life and Times of Alexander Mackenzie* (1892), and *The Universities of Canada and Their Origin* (1896).

Ross, James Clark, a famous arctic and antarctic explorer, and British navigator, the nephew of Sir John Ross, was born at London on April 15, 1800. He began his explorations in journeys with his uncle. In June, 1831, he determined the approximate position of the northern magnetic pole. In 1839-43 he was in command of the Erebus, which, with the Terror, roamed the antarctic seas and reached the furthest southern latitude hitherto explored (seventy-eight degrees ten S.). On this voyage Mt. Erebus was discovered and named, a volcano having a height of 13,300 feet. He also discovered icebound Victoria Land. Subsequently Ross was honored with knighthood, and published *A Narrative of the Antarctic Regions*. He died near Aylesbury, England, on April 3, 1862.

Ross, Sir John, a British navigator and explorer, was born in Scotland on June 24, 1777, the son of a minister of Inch, Wigtownshire. He was little more than nine years of age when he entered the navy, serving with distinction in the French wars. His most important services were rendered in the arctic regions in 1818 as second in command under Commander Parry, the object of the expedition being to explore Baffin Bay and attempt a northwest passage. In 1829 he commanded an expedition to the arctic regions, fitted out by Sir Felix Booth, and discovered the peninsula of Boothia Felix. In 1850 he made yet another voyage to the polar regions—an unsuccessful attempt to find Sir John Franklin. He died at London on August 30, 1856. His works include *Voyage of Discovery* (1819); *Treatise on Navigation by Steam* (1828), and *On Intemperance in the Royal Navy* (1852).

Ross, Nellie Tayloe, the first woman in the United States to hold office as State governor, was born in St. Joseph, Missouri in 1880, the daughter of James Wynne and Elizabeth Blair Tayloe. Most of her girlhood was passed on a ranch in Texas on which her parents had settled when she was a small child. She was educated in public and private schools and from early childhood displayed a deep interest in literature. In 1902 she was married to William Bradford Ross, a young lawyer, in Omaha, Nebraska. Shortly after their marriage they established residence in Cheyenne, Wyoming where for twenty years Mrs. Ross devoted herself to her home, three children, and the interests of her prosperous husband. In the course of those years William Ross became a prominent attorney. In 1922 he was elected Governor of Wyoming. Mrs. Ross was ever interested in the problems of state with which Governor Ross was occupied. On October 2, 1924, Governor Ross died. The ideals of government which he had cherished were carried out by Nellie Tayloe Ross who, on January 5, 1925, was elected to fill out her husband's unexpired term of office. As Governor of the State of Wyoming Mrs. Ross endorsed tax relief for farmers which would provide an equitable distribution of taxation throughout the agricultural districts of the State; legislation which would require every county, school board and State council to formulate a budget the provisions of which were to be made public before the levying of any tax; and the direct primary. During her term of office legislation was passed to protect bank deposits throughout the State. In 1926, however, Mrs. Ross was defeated at the polls for re-election. From 1926-28 she lectured and wrote for several magazines. In 1928 she became vice chairman of the Democratic National Committee in charge of women's activities. She maintained an office in Washington, D. C. In May, 1933, President Roosevelt appointed Nellie Tayloe Ross Director of the Mint. On March 7, 1934, she resigned as vice chairman of the Democratic National Committee. Mrs. Ross is the first woman in the United States to bear the distinction of having held two major offices of government.

Rosse (*rŏs*), **William Parsons**, THIRD EARL OF, a distinguished British astronomer, was born at York in 1800. While still a student at Oxford University, young Rosse was elected to Parliament as a member for King's County, Ireland. He retained his seat in Parliament from 1821 to 1834. In the latter year he resigned in order that he might devote his entire time to the improvement of reflecting telescopes. In 1843 he became president of the British Association. The great Rosse telescope was erected in 1845 at Parsonstown in King's County. Four years later the distinguished gentleman became president of the British Royal Society and served in that capacity until 1854. He became vice-chancellor of Dublin University in 1862. The greater part of the astronomer's work had been thus far concentrated on perfecting the construction of the speculum of the reflecting telescope. He had already succeeded in casting a giant speculum six feet in diameter and fifty-four feet in focal length which was mounted in his park at Birr castle. The field of astronomy was greatly enriched by the resolution into groups of stars of certain nebulæ which this telescope made possible, nebulæ which had withstood the tests made with Herschel's instrument. Astronomers further discovered through the use of Rosse's telescope numerous binary and triple stars. His telescope was particularly valuable in that its huge surface remained unblemished by either cracking or warping which usually occurs from the ordinary casting processes during the cooling period. Rosse had also succeeded in reducing to a minimum light absorption and spherical aberration.

Upon the death of Rosse in 1867, his son, Lawrence Parsons, the Fourth Earl of Rosse (1840-1908), continued his father's work. Today, however the telescope is no longer in use, having been dismounted after the discovery that the polished surfaces tarnished so rapidly, a condition which cannot be permanently remedied.

Rosser, Thomas Lafayette, a noted Confederate soldier and American civil engineer, was born in Campbell County, Virginia, in 1836. He was educated at West Point, but resigned from that academy in 1861 upon the outbreak of the Civil War. Young Rosser enlisted with the Confederate Army serving in the artillery. The following year, however, he was given the command of a brigade of cavalry and with the army of Northern Virginia he performed distinguished service, taking part in all the campaigns of that army. In 1864 he was promoted to the rank of brigadier-general and sent to the Shenandoah Valley to reinforce General Early. His cavalry was routed by Torbert, however, on October 9, 1864, in what is known in history as the "Woodstock Races." After spending a long and arduous winter in the valley, Rosser rejoined General Lee in the spring. He made his escape in 1865 after refusing to surrender with Lee, and made an attempt to reorganize the Confederate troops in Northern Virginia. Major General Rosser was captured, however, and after his release turned his attention to the study of law. In 1871 he became chief engineer of the Canadian Pacific Railroad and was occupied in railroad construction work. In 1886 he returned to Virginia. During the Spanish American War he served as brigadier-general of the United States volunteers. Rosser died in 1910.

Rossetti (*rō-sĕt'ē*), **Christina Georgina**, a famous English poet and the sister of Dante Gabriel Rossetti, was born at London, on December 5, 1830. She was of Italian origin, the daughter of Gabriel Rossetti, a well-known commentator on Dante. She began early to write verse. Her mood was religious and reflective although inclined somewhat to mysticism, and she had a woman's soulfulness, insight and grace. Her chief productions are *The Prince's Progress, Goblin-Market* and *Other Poems,* with a volume of children's stories, entitled *Speaking Likenesses,* and a collection of nursery rhymes, entitled *Sing-Song.* She died on December 29, 1894.

Rossetti, Dante Gabriel, a famous English painter and poet, whose name was actually Gabriel Charles Dante Rossetti, was born at London on May 12, 1828. His famous poem *The Blessed Damozel* was written before he was twenty years of age, and revealed his genius. His first picture was "The Childhood of the Virgin," painted in 1849. About this time Rossetti joined Hunt, Millais and others in forming the Pre-Raphaelite Brotherhood. This coterie powerfully influenced modern art. Rosetti's best known literary work consists of *The Earlier Italian Poets* (translated in the original meters), *Poems* and *Ballads*. All rank high; in fact, competent critics rank his poetry much higher than his painting, as he never adequately reached the mere technique of his art. He painted both in oil and in watercolor. His subjects were taken from medieval legends, especially from those about King Arthur, and from ancient ballads. Among his principal pictures are *Dante's Dream*, *Dying Beatrix*, *Sibylla Palmifera* and *The Blessed Damozel*. His reputation as a painter rests mainly on the enthusiasm of the critics, "few but fit," who have seen his pictures in private collections. Consult Benson's *Rossetti* in the English Men of Letters Series and W. M. Rossetti's *Memoirs*. See PRE-RAPHAELITISM.

Rossetti, Gabriele, a celebrated Italian author, was born at Vasto in the kingdom of Naples, Feb. 28, 1783, and at an early age was placed by the Marchese del Vasto to study in the University of Naples. His boyhood and youth were in a time of great political commotion; and in 1824 he went to London as a political refugee. In that city he lived a quiet and studious life. Among his works was a commentary on Dante (*q v.*), in which he tried to show that the works of that great poet were antipapal in their hidden meaning and that Beatrice was a symbolic personage, not a real woman. Rossetti's views in reference to Dante excited a controversy that has not ceased His memory is much revered in Italy, especially in his native town, where the house of his birth has been purchased as public property, and a theater and the chief public square have been named after him. He died at London, April 26, 1854.

Rossini (*rôs-sē'nē*), **Gioacchino,** a great Italian operatic composer, was born at Pesaro on Feb. 29, 1792 At 15 he was sent to study at the Lyceum of Bologna. His first important opera was *Tancredi* (1813), which immediately raised him to honor and fame. In 1823 he produced *Semiramide*, the most gorgeous of his operas, in Venice, after which he visited Paris and London, at both of which he was received with the greatest enthusiasm. Being appointed director of the Italian opera in Paris, in 1829 he produced his greatest work, *William Tell*, which was conceived and written in a style very different from his Italian operas and more in conformity with modern dramatic ideas. With the exception of his well-known *Stabat Mater*, he may be said to have closed his career with *William Tell*, large offers from the managers of opera-houses failing to draw him from his retirement. He died at Paris, Nov. 13, 1868. See biography by H. S. Edwards and *Life* in the Great Musician Series, by the same author.

Ross'land, Can., the center of the important mining district of the West Kootenay, lies six miles north of the international frontier in British Columbia, and has a population of 6,159, which is being rapidly augmented. Gold, silver and copper in marked abundance underlie the countryside about, and its prosperity and growth are assured.

Rotary Clubs, organizations of professional and business men, each club a unit but the whole working together on a general plan of service including: charity to unfortunate children, development of codes of ethics among business and professional men, and promotion of international peace through a world fellowship of men engaged in professions and business. The first club was founded in 1905 at Chicago, and included four men: a lawyer, a mine operator, a dealer in coal, and a tailor. The lawyer, Paul P. Harris, was the actual founder. It became a rule that only one man from a business or profession could be a member. From this beginning, Rotary clubs have been organized in many cities throughout the world.

Rota'tion of Crops refers to the growth of two or more different kinds of farm-crops in regular order during successive years. It is practiced primarily to keep up the fertility of the soil and, incidentally, to keep down weeds. Available plant-food is being continually added to the soil by the decay of its mineral constituents. (See SOIL.) But a crop needing more of a given substance than is naturally made available will, in time, use up the surplus already accumulated. The value of crop-rotation depends upon the facts (1) that not all plants use the same amounts of the plant-foods in the soil, though but five per cent. of the total plant-body comes from this source; (2) that they get their mineral foods from different depths of the soil by having roots of different lengths; (3) that some plants can use mineral food in a less advanced stage of decay than can others; (4) that some crops with large root-systems leave much vegetable matter in the soil after harvest to change its physical properties (see CAPILLARITY); (5) that the extra cultivation required by some farm-crops to save the soil-moisture operates also to keep down weeds and insect-pests or to clean out such as have gotten a foot-hold while another crop was growing; (6) that leguminous crops bring about a positive addition of nitrogen, which is most likely to be lacking (see NITROGEN-GATHERING CROPS); (7) that different crops, by ripening at different times, serve to simplify the farm-labor problem; and (8) that the resulting diversified farming minimizes the financial loss from climatic conditions that are apt to hurt one crop more than another. Some of the most approved systems of crop-rotation are here given: In the central states a four-year rotation-series of clover, corn and oats or potatoes, followed by wheat; in the higher latitudes, as the wheat-belt of the northwest, a crop of corn or potatoes or even a summer fallowing after two or three crops of wheat and flax. In such a four-year rotation three crops of wheat yield as much as would four without rotation being practiced. When the soil lacks nitrogen, clover or alfalfa should find a place in the series. In the southern states a specially recommended series is cotton, corn, oats and cowpeas, distributed over three years, in which oats, sown in the fall, will be followed by cowpeas the next spring. Peas are also sown between the cotton rows. Consult Roberts' *The Fertility of the Land* and the U. S. Dept. of Agriculture's Year-book for 1902: *Practices in Crop-Rotation.*

Rothschilds (*rŏths'chīlds*), the well-known family of bankers, take their name from the sign of the house (*Zum Rothen Schilde* or The Red Shield) in the Jews' quarter of Frankfort, in which their ancestors lived. The founder of the great banking-house was Mayer Anselm Rothschild, who was born in 1743 and died in 1812. Although educated to become a Jewish rabbi, he began his career in the banking business at Frankfort, and so won the confidence of the landgrave of Hesse, that he was intrusted with the management of that prince's finances. There is a story that he hid the treasures of the landgrave, amounting to more than $5,000,000, from the French invaders of 1806, and was allowed the free use of the money for several years, thereby laying the foundations of his great fortune. Whether this be true or not, his business soon immensely prospered, and the house became a financial power that was felt by all the governments of Europe. Before the senior Rothschild's death he saw his five sons established as financial kings in the principal capitals of Europe — Anselm the eldest was established in Frankfort, Nathan in London, Solomon in Vienna, James in Paris and Charles in Naples. Nathan is said to have known the result of the battle of Waterloo several hours before the English government, and the knowledge was worth $1,000,000 to him. He was succeeded by his son Lionel, who distinguished himself by his efforts to secure the removal of the civil disabilities to which the Jews were formerly subject in England. See *The Rothschilds* by Reeves.

Rotterdam (*rŏt'tẽr-dăm*), the busiest port of Holland, stands on both sides of the Maas, 20 miles from its mouth and 45 from Amsterdam. Its trade has grown rapidly since Belgium separated from Holland, especially since the middle of last century. In 1888 the quays measured 15 miles in length, and the docks covered nearly 200 acres. Since then two new docks have been constructed, and the wharves have been extended. More than 50 per cent. of the vessels that enter the various ports of Holland (estimated by their tonnage) enter at Rotterdam. The total tonnage entering Rotterdam yearly amounts to 7,500,000 tons. From this port 5,000 to 15,000 emigrants sail yearly to the United States and other countries. Rotterdam counts among her famous sons Erasmus and Tollens the poet. Population 417 780.

Rouen (*rōō'än'*), formerly the capital of Normandy and, after Lyons, the chief manufacturing city of France, is situated on the right bank of the Seine, about 90 miles from Paris by rail. The modern streets are well and regularly built; but a considerable part of old Rouen still remains. The Seine makes Rouen, although 80 miles from the sea, the fourth shipping-port of France, and extensive improvements in deepening the river and building wharves yearly add to its capacity and importance. Its total trade exceeds $50,000,000 a year. William the Conqueror died at Rouen in 1087. During the wars of Henry V and Henry VI of England it was subject to the English from 1419 to 1449, when it was retaken by the French under Charles VI. During its occupation by the English Joan of Arc was burned alive in the square of the city in which stands her statue. Population 124,987.

Rouge River, Quebec, Can., waters a fertile and well-wooded plain, runs from north to south, and has its principal source in a series of lakes between Joliette and Montcalm Counties. Its principal branch flows into the Ottawa between Grenville and Pointe du Chene. Timber can be floated throughout its entire length.

Rough Rid'ers. The original rough-riders were the men who carried messages through the western states before the organization of the pony-express in 1859 The name was used by William R. Cody who, in his Wild West show, had a congress of the rough riders of the world. In the Spanish-American war Congress authorized the raising of a cavalry regiment from among the wild riders and rifle-men of the Rockies and Great Plains. The mustering-places for the regiment were appointed in New Mexico, Arizona, Oklahoma and Indian Territory, and the men were to gather at San Antonio, Texas. The regiment was given the official title of the First United States Volunteer Cavalry, and Dr. Leonard Wood was placed in command with the rank of colonel and Theodore Roosevelt was made second in command with the rank of lieutenant-colonel. Seven hundred and eighty men were originally allotted, but the number was soon raised to 1,000. Men from all parts of the country and from almost every walk in life and social position were eager to enlist. Indians, half-breeds, cowboys, miners, ranchmen, college-athletes and New York and Boston club-men were numbered among those enlisted. The uniform adopted was a slouch-hat, a blue flannel-shirt, brown trousers, leggings, boots and a large handkerchief knotted loosely around the neck. In spite of protests of commanding officers they were promptly christened The Rough Riders, which name they since bear with pride. Among the first to be ordered to the front and brigaded with the First and Tenth Regular Cavalry under Brigadier-General Young, they played an important part in the Santiago campaign in which took place some of the hardest fighting of the Spanish-American War. Before disbanding in 1898 a Rough Riders' Association was formed, to which members of the regiment are eligible, the right to membership to descend to the oldest son.

Round Table, The, a table, according to Arthurian tradition, designed by Merlin, a Welsh sage and enchanter of the 5th century, for Uther Pendragon, a British king, to seat 50 knights at feasts. According to the legend, these knights were to be distinguished for piety, courage and fidelity; they originally formed a military order known as The Knights of the Round Table, but the organization also became a theocratic one. As they gathered round the table, the seat was reserved (styled the seat-perilous) for the knight of their number, or who was afterwards to appear, whose achievement of the Holy Grail was certain. In due time the vacant seat was filled by the Arthur of romance, a brave, virtuous and accomplished knight, whose exploits fill all the poetry of the middle ages. He was the son of Uther Pendragon by Igerna, and was educated and instructed by Merlin, who figures in Spenser's *Faërie Queen*, in the tales and romances of medieval chivalry and in Tennyson's *Idyls of the King*. Arthur woos and weds Guinevere and makes her his queen; he has, however, to wage war for her with Sir Lancelot (son of the king of Brittany and one of the knights of the Round Table). Much of the legend of this knight (who was father of Sir Galahad by Elaine) has to do with his (Lancelot's) guilty love for Guinevere and with the exploits he performed in her service. The Round Table is fabled to have been constructed in imitation of the one which Joseph of Arimathea established in imitation of that used at the Last Supper. According to another tradition, Arthur himself established the Round Table at York and founded at Winchester his order of knighthood.

Rousseau (*rōō'sō'*), **Jean Baptiste,** a great lyric poet of France, was born at Paris, April 16, 1670, the son of a shoemaker. When quite young he began writing pieces for the theater which were unsuccessful. In 1712 he was banished for failing to make good a charge of libel brought against a fellow writer, and spent the remainder of his life abroad, a part of the time in Switzerland. At Brussels he became acquainted with Voltaire, who first was his friend and then his enemy. His sacred odes and songs, and especially his epigrams, took high rank. Rousseau died at Brussels, March 17, 1741

Rousseau, Jean Jacques, a noted Swiss-French philosopher, was born at Geneva, June 28, 1712. In 1741 he set out to make his fortune at Paris. Here he lived in a dirty, shabby inn, earning a livelihood by copying music. Here he met Thérèse le Vasseur, who lived with him the remainder of his life. He wrote for Diderot's *Encyclopedia*, but first came into notice through his *Discourse on Arts and Sciences*, which won a prize. His independence of thought and the freshness of his brilliant style made him celebrated and welcome in society. In 1753 he brought out a successful opera, full of sparkling airs, one of which is the well-known hymn-tune: *Rousseau's Dream*. In 1760 his romance of *The New Héloïse* was at once received with applause. Two years later came the *Social Contract* and *Émile*. The first of these three works raised Rousseau to the first rank as a writer of romance; the second, as a political socialist; the third, as a writer on education. His *New Héloïse*, by its passion, influenced the society and literature of France, Italy and Germany, and its idyllic pictures and fine descriptions touched the fashionable world with a love for country life and simple ways; while the whole book was a lesson on the rights of the poor and the duties of the rich. The *Social Contract* taught that no laws are binding unless agreed upon by all the people, and Rosseau's "liberty, equality and fraternity" became a war-cry of the French Revolution. His ideas on children's training, set forth in *Émile*, were used by great teachers like Froebel and Pestalozzi, but in a part of the book he showed himself a deist in religion, and horrified the church as much as he disgusted such men as Voltaire and D'Alembert. He was denounced by the archbishop of Paris, his book burned, and himself ordered under arrest. He fled the country, and for a while was given a home by the historian Hume in England, where he wrote his famous *Confessions*. His trials and broken health had made him senselessly suspicious. He distrusted his best friends, and was sure that the English government sought his life. So he soon went back to France, living in various places provided by his friends, and wrote his *Reveries*. His delusions increased, so that everywhere he felt that he was watched by spies, and hated even by the children on the streets. He died near Paris, July 2, 1778. See Morley's *Memoir*.

Rousseau, Lovell Harrison, American soldier, was born in Kentucky, Aug. 4, 1818. He fought in the Mexican War under General Taylor, and on his return practiced law in Louisville. In the Kentucky senate during 1860 he opposed secession, and later raised two regiments of Union men. In 1861, as brigadier-general, he fought in Buell's army at the battle of Shiloh, April 7, 1862. He was in the battle of Perryville, Ky., Oct. 8, and at Murfreesboro, Dec. 31, of the same year, and for gallantry was promoted to the rank of major-general. In November, 1863, he was appointed to command the district of Tennessee, resigning two years later. When Alaska was purchased in 1867, he was assigned there as brigadier-general in the regular army, and in the year following was transferred to the command of the department of Louisiana. He died at New Orleans, Jan. 7, 1869.

Rousseau, Pierre Étienne T., a prominent landscape-painter of France, was born at Paris, April 15, 1812, the son of a tailor. A kinsman, himself a painter, saw a landscape the boy had painted when 14, and persuaded his parents to have him study art instead of engineering, as they had intended. However his best teachers were not the artists to whom he was sent, but the old masters in the Louvre, while his happiest hours were spent in sketching from nature in the country around Paris. Some of his best pictures were rejected by the *Salon*, and for many years he struggled against neglect and discouragement. But later his worth was acknowledged, and he was made an officer of the Legion of Honor. Among his best landscapes are *The Alley of Chestnut-Trees* and *Early Summer-Morning*. He died near Fontainebleau, Dec. 22, 1867. See D. C. Thompson's *The Barbizon School*.

Rowan Tree (*rō′ăn*). See Ash.

Row′land, Henry Augustus, easily first among American physicists, was born at Honesdale, Pa., on Nov. 27, 1848, and died at Baltimore, Md., April 16, 1901. He received his education — if we may speak of such a genius as having received anything in education, other than what he worked out for himself — at Rensselaer Polytechnic Institute in Troy, where he graduated with the degree of civil engineer in 1870. During 1871–2 he taught science at Wooster College in Ohio. From 1872 to 1875 he taught physics at his alma mater in Troy. During these three years he prepared a very important paper on some problems in magnetism which at once gave him a reputation in Europe. In 1872 he was selected by President Gilman as one of the original staff of Johns Hopkins University. He, however, was immediately given a year's leave of absence, and in 1876, at Helmholtz's laboratory in Berlin, he made one of the most important electrical discoveries of modern times: *Electric charges when put into rapid motion exert magnetic forces exactly as do the equivalent electric currents.* The story of his work during the next quarter-century at Johns Hopkins University is too long for recital here. Suffice it to say that within a few years his researches on the mechanical equivalent of heat; the value of the absolute unit of electrical resistance; the diffraction-grating; the spectra of the elements; and the solar spectrum won distinction and honor for him from all the more important learned societies of the world. Among his greatest discoveries must be mentioned the curved grating which is the essential part of the most powerful form of spectroscope known, and does not involve in its construction any lenses. His printing, multiplex telegraph, on which he was at work at his death, formed one of the most interesting exhibits at the Paris exposition and has recently been adopted by the German government.

President Gilman says of him: "He knew how to ask a difficult and far-reaching question, and he knew how to seek the answer. Extraneous considerations were excluded when he saw the point of an inquiry, and on that point he concentrated all his powers. For example, when he began the brilliant series of experiments in spectrography, which made him peerless in this domain, he saw that the spectrum depended on the accuracy of the gratings, the gratings on the dividing-engine and the dividing-engine on the screw; so he began the study of light by devising and making a screw more exact than any screw that has ever been produced by the most accomplished makers of instruments of precision." For details of his work see sketch by Professor Ames in *Astrophysical Journal*, May, 1901, and another by Prof. H. F. Reid in *American Journal of Science*, June, 1901.

Royal Canadian Academy, The, was founded by the Marquess of Lorne and the Princess Louise in 1880, L. R. O'Brien becoming its first president. Nearly every native artist of established repute is a member, and the younger men of promise have largely been admitted as associates. Wherever exhibits of international moment have been given since its foundation, its members have been able to carry off prizes in the face of the competition of the world, notably at Chicago, Buffalo and St. Louis.

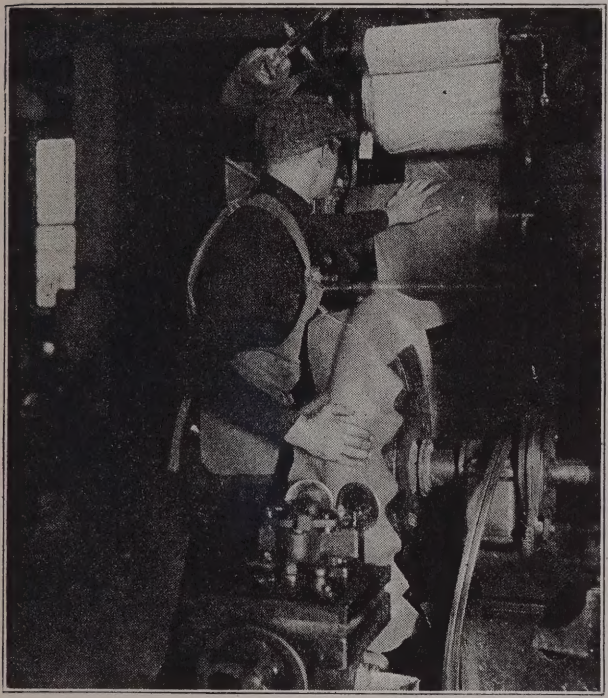
Royal Military College. During the session of the Canadian Parliament of 1874 the minister of militia, with the sanction of Premier Alexander Mackenzie, introduced a bill providing for the establishment of a military college resembling those at Sandhurst (England) and West Point (United States). Instruction in subjects bearing on military matters was to be imparted by officers from the Imperial Army, and the teaching staff was to include instructors in French, engineering and other subjects. From this act of Parliament has grown Canada's Royal Military College. Its fine buildings are picturesquely situated on the lake-shore east of Kingston (Ontario) on the same point of land as Fort Frederick. Fort Frederick and Fort Henry give a military atmosphere to the neighborhood and are used as object lessons in military tactics and maneuvers in the training of the cadets. The college opened in 1876 with a class of eighteen. The first commandant was Lieutenant-General E. O. Hewett. He remained in charge until 1886, and upon resigning was thanked by the government for his successful administration of the affairs of Royal Military College. Graduates of the Royal Military College obtain positions in the Imperial Army and Canadian forces. Cadets must pass a competitive examination on entering, and are required to take yearly examinations afterwards in order to obtain diplomas. Although the college is organized on a strictly military basis, thoroughly practical and complete courses of study in other subjects are given. These courses include such subjects as civil engineering, civil and hydrographic surveying, physics, chemistry, and the study of French and English. The constant practice of gymnastic drills, riding and outdoor games and exercises of all kinds ensure good health and fine physical condition to the young men attending the college. Seven commissions in the Imperial Army are awarded yearly to the cadets who stand the highest. The length of the course is three years, which are divided into three terms of nine and a half months' residence each. The total cost of the course, including board, uniform, tuition, books, laboratory equipment and all extras, amounts to about $900.

Royal Society of Canada, The, was founded by the Marquess of Lorne in conjunction with the leaders of thought in the Dominion, and its first meeting took place at Ottawa in 1882, Sir William Dawson presiding. Only 80 members are elected, divided into sections numbering 20 each. The first is devoted to French-Canadian literature and history, the second to English-Canadian literature and history, the third to mathematical, physical and chemical science and the fourth to geological and biological science. Meetings are held yearly in May, usually at Ottawa, and the transactions, filling a large volume, are published annually at governmental expense.

Rub'ber Man'ufac'ture. In a number of different kinds of tropical trees is found a secretion that does not seem to be essential to the life of the tree, in which float minute globules of rubber. Many methods of securing this secretion, usually called rubber-milk, are employed; but the most common and economical way is to make incisions in the trunk of the tree. As the rubber-milk flows out, it is caught in a small cup of clay and at the end of each day emptied into a larger vessel. The old and still common way of separating the small globules of rubber from the rubber-milk is by evaporation. Where rubber-milk is collected in large quantities, however, a machine similar to a cream-separator is used. This collects the rubber on the top and drives the water and all impurities to the bottom. The manufacture of rubber began about 1820. The application of rubber to making waterproof cloth first gave commercial importance to rubber. The first to make this application of rubber was Charles McIntosh, who reduced it to a solution in naptha and spread it between two pieces of cloth. Waterproof coats still bear his name. Williams Chaffee developed a rubber-varnish for coating different materials to make them waterproof. The Roxbury Rubber Company was formed in 1833, and for a time did a flourishing business, but it was soon found that the articles manufactured had a tendency to harden and crack in winter and become soft and sticky in summer. In the meantime Charles Goodyear was trying to overcome this defect by mixing pure rubber with various other substances. Nathaniel Hayward of Woburn, Mass., found that by mixing dry sulphur with pure rubber the stickiness was removed. Goodyear acquired Hayward's patent. By accident he dropped some of the mixture on a hot stove and found that it did not melt. He then placed it in extreme cold and found that its texture was not changed. Thus the art of vulcanizing rubber was discovered, for the process consists simply of mixing sulphur with pure rubber and then subjecting the mixture to moderate heat for a period of time. The mixture varies from soft to hard according to the amount of heat applied. Although sulphur is the only essential ingredient, others, as asphalt, carbonate of lead, magnesium, silicate or tar, are often added, each of which imparts a different quality to the product. In 1931 announcement was made of a method of making artificial rubber from acetylene, salt and water. It is not a substitute but a supplement to real rubber.

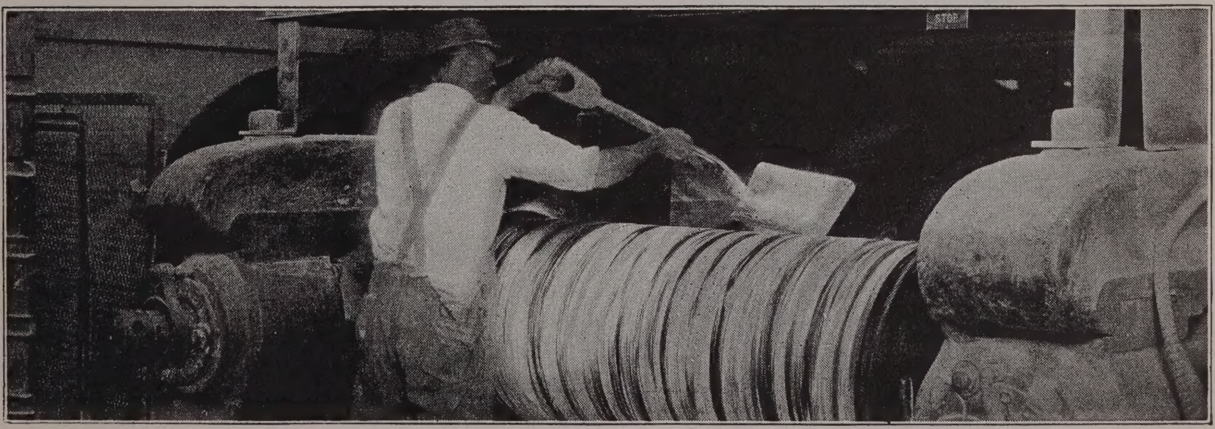
Ru'bens, Peter Paul, a celebrated painter of the Flemish school, was born at Siegen in Westphalia, June 29, 1577. In 1579 his father, who was a lawyer, died, and his mother went back to her native city of Antwerp, where young Rubens was taught at a Jesuit school. For a while he served as a page, but at 13 began to study art. In 1600 he went to Italy, studied the works of Titian and Paul Veronese, and became court-painter to the Duke of Mantua. In 1605 he was sent on a mission to Philip III of Spain and proved a good diplomat. At Madrid he painted the portraits of many of the nobility. He settled at Antwerp in 1609, and became court-painter to Archduke Albert. The same year he married his first wife, Isabella Brant, whose likeness he so often painted. Between 1611 and 1614 he painted his *Descent from the Cross*, which is usually thought to be his masterpiece. At Paris he painted over a score of pictures for the queen-mother, Marie de Medici, illustrating her marriage with Henry IV. Sent on a mission to Philip IV of Spain, he stayed nine months in Madrid, became acquainted with Velasquez, and painted some 40 pictures, among them five portraits of the king.

Jungles like this had to be cleared away before planting of rubber trees could take place. This picture was taken on the island of Sumatra in the Dutch East Indies on a plantation during the clearing operations.



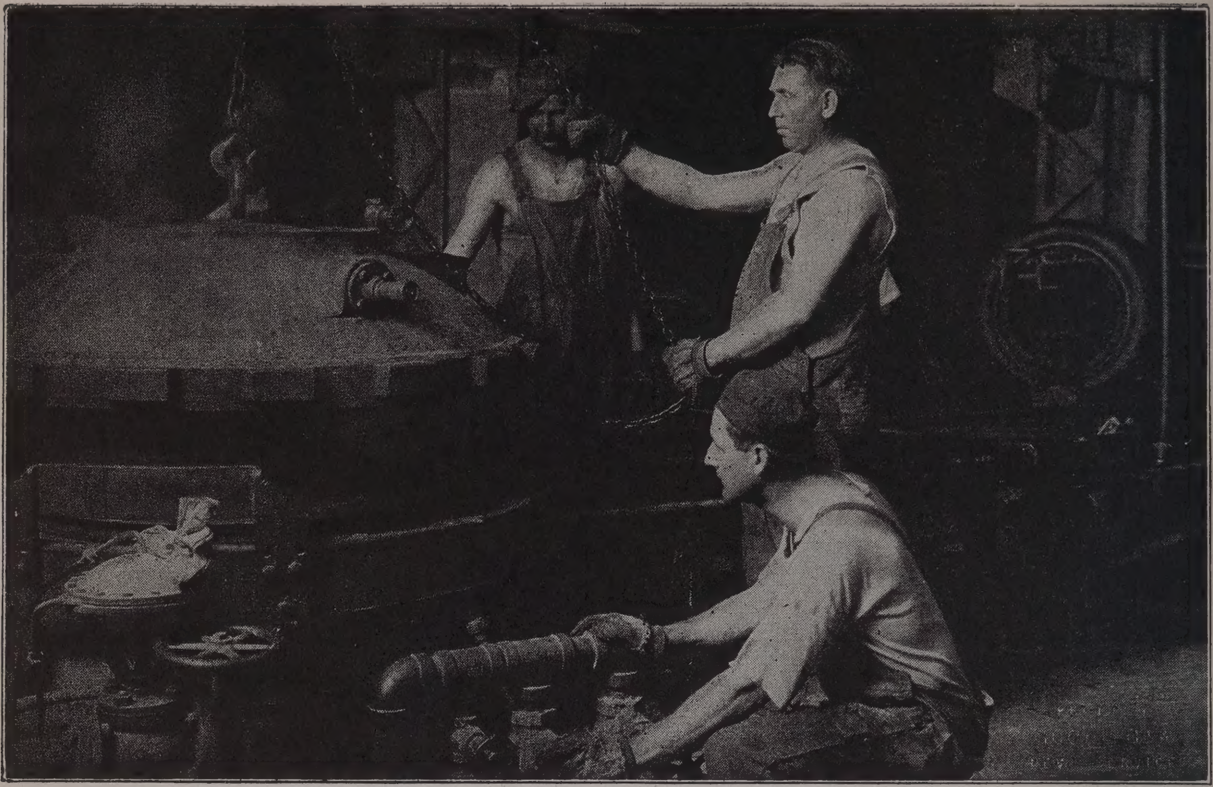
Laying down successive rubber piles. Picture shows the second step in building a tire.

This man is finishing a tire. He is putting on the final touches.

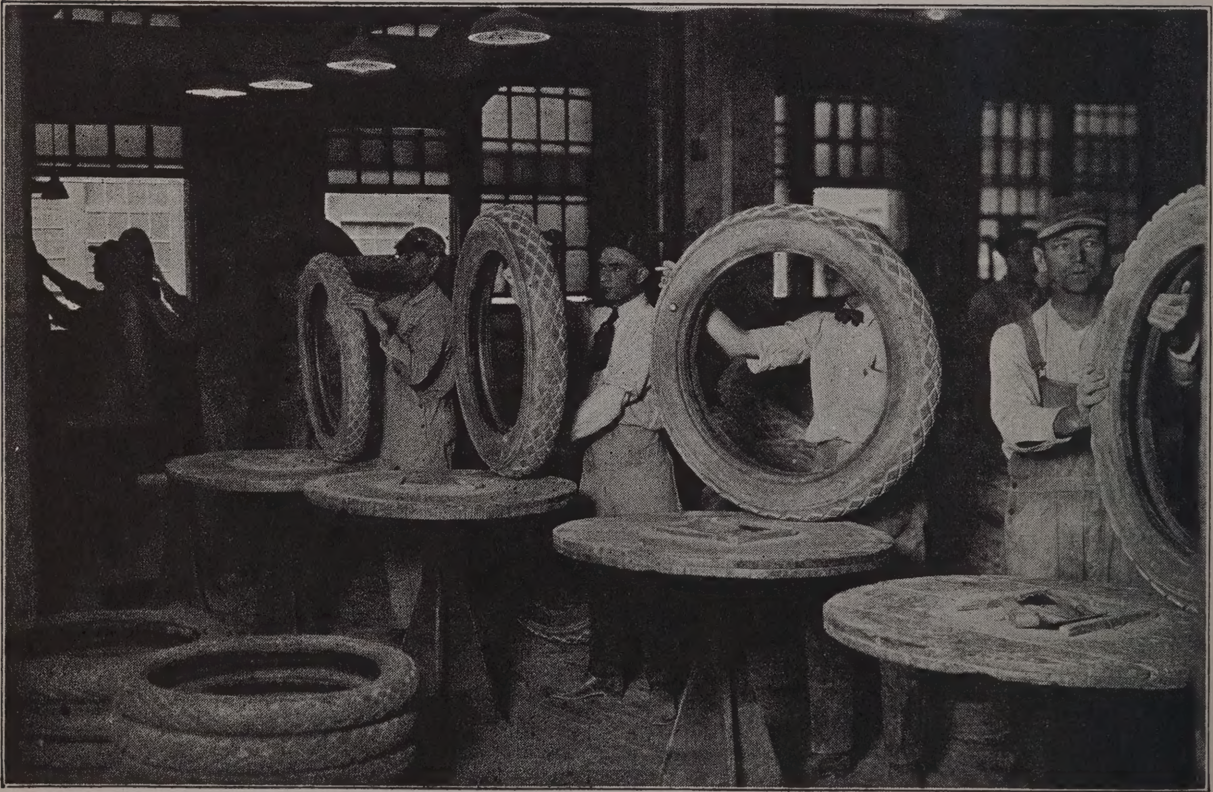


A mixing mill where rubber and compounds are mixed, rolled and kneaded together into thick rubber sheets. The man is adding a white compound to his batch of rubber on the big roller.

Pictures Courtesy of Goodyear Tire & Rubber Co.



Where tires are cured or vulcanized. In the pits or heater room. The men in the picture are just removing the lid of a heater.



Final inspection. From the time rubber starts in the big milling machines until it finally emerges as tires, it must pass rigid inspections. Faulty tires are not put into stock.

Pictures Courtesy of Goodyear Tire & Rubber Co.

He was also sent as envoy to Charles I of England to treat for peace. He accomplished his mission with great tact, and painted the portraits of the king and queen as well as other English pictures. He was knighted both by Charles I and Philip IV. In 1630 Rubens married his second wife, Helena Fourment, a beautiful girl of 16. The main features of Rubens' work are power, spirit and life. Reynolds said: "Rubens perhaps was the greatest master in the mechanical part of the art, the best workman with his tools, that ever used a pencil." In all, Rubens painted several thousand pictures. He died at Antwerp, May 30, 1640. See C. W. Kett's *Great Artists*.

Rubicon (*rṳ'bĭ-kŭn*), a stream of central Italy, falling into the Adriatic, became famous from Cæsar's passage of it in the middle of January, 49 B. C, on his march on Rome. It formed the southern boundary of his province, so that by crossing it he really declared war on the republic. It is said that Cæsar hesitated a while on the bank and then crossed with the words: *Jacta est alea* (the die is cast). So "crossing the Rubicon" has come to be a proverb with reference to any decisive step.

Rubinstein (*rōō'bĭn-stīn*), **Anton Gregor,** composer and pianist, was born near Jassy, Rumania, Nov. 30, 1829, and died near St. Petersburg, Nov. 20, 1894. Early in life he became a pupil of Abbé Liszt at Paris, after which he gave a number of notable concert-tours, and by his compositions and playing created a sensation. In 1858 he became a director of the Russian imperial concert and later founded the St. Petersburg Conservatory of Music. He visited England and France a number of times, as also the United States. His compositions have lyric melodiousness and are characterized by much feeling and sweetness. He held deservedly high rank as a pianist, having a mastery of technique and manifesting great musical sensibility. He wrote about 20 operas, besides overtures, sonatas, concertos, symphonies and vocal pieces. In 1887 he was awarded the French decoration of the Legion of Honor, and in 1889 received a grand jubilee *fête* at St. Petersburg. In 1890 appeared his *Autobiography*, and later a *Conversation on Music* came from his pen.

Ru'ble or **Rouble,** a Russian coin, the principal monetary unit of the nation. Before the World War it was worth about 50 cents, or two shillings in English money, while 9.47 rubles equalled $5.00 in gold. Gold was coined in 10 and 5 ruble pieces, the 10 ruble piece being worth $5.30 while the paper ruble has different values. The ruble was worth 100 kopecks, a kopeck being worth ½ cent. The ruble is still the monetary unit of the Russian currency system, though its value, because of the unstable governmental and economic system, is unreliable.

Ru'by, a much-prized gem, is a pure, transparent, red-colored variety of corundum, sapphire being a blue variety of the same mineral. Corundum, which is aluminum oxide, forms the hardest of all gems except the diamond. Although usually red, yet pink, purple and violet rubies are found, but the most valuable are those of the color called pigeon's blood. The finest eastern rubies are more highly prized than diamonds of like size and quality. Those over a carat in weight are worth from $100 to $1,000 a carat, and no stone increases so much in value as it increases in size. But rubies perfect in color, transparency and freedom from flaw are much rarer than good diamonds. Rubies seldom weigh more than eight or ten carats, but Gustavus III of Sweden presented one to Catherine of Russia as big as a pigeon's egg. One owned by the king of Ceylon was, according to Marco Polo, a span long, as thick as a man's arm and without a flaw; Kublai Khan vainly offered a city for it. The finest rubies come from Upper Burma. Dark-red rubies are found in Siam and purplish rubies in Ceylon. Rubies are also found in the mountain region of Yunnan in China, in Afghanistan and in the basin of the Oxus. They have also been found in New Guinea, Victoria and New South Wales. Many of the so-called rubies of jewelers are varieties of spinel, a mineral softer than corundum and mostly made of alumina and magnesia. Artificial rubies are made which are used in watches, and for this purpose are equal to natural rubies. Although they are identical in composition and hardness with the natural stones, the use of them as gems is considered fraudulent. They may usually be detected by microscopic examination, since they generally contain minute bubbles.

Ruff, a bird allied to the sandpiper. It breeds in the north of Asia and Europe, and migrates southward as far as the Cape of Good Hope. It is found as a straggler in Iceland, in Canada and in some of the eastern states, and is sometimes shot on Long Island. The male bird, the ruff, is about a foot long. In the spring it sheds the feathers of the face; curled tufts of feathers appear on the sides of the head; and an erectile ruff grows which lasts two months. The ruff, as well as the feathers of the back, shows every variation of color in different birds, but each bird yearly regains its own peculiar color. The female, the reeve, is about one fourth smaller. The males fight for the possession of the females, and in battle the ruff serves for defense. The nest is made in the coarse grass of a hummock in a moist, swampy place. The four eggs are grayish green, marked with reddish brown. The birds eat insects, worms, seeds and rice. Ruffs are often captured and fattened for the table.

Ruffini (*rōōf-fē'nē*). **Giovanni,** one of the foremost Italian novelists, was born at

Genoa about 1809. He was a fellow-student of Mazzini (*q. v.*), and helped him to organize his famous association, called Young Italy. In 1848 Ruffini was Sardinian ambassador at Paris, but next year he made his home in England. His novel of *Lorenzo Benoni* is based on his own life. His most famous book is *Doctor Antonio*. He died in 1881.

Rug'by, a town of Warwickshire, England, is 30 miles southeast of Birmingham. The gunpowder plot was hatched near here, and the battlefield of Naseby is not far. Its famous school was founded in 1567 by Lawrence Sheriff, a grocer and stanch supporter of Queen Elizabeth. Under famous Dr. Arnold the school gained a national reputation. Rugby is now, by all odds, the best school in England. Among its many well-known students were Landor, Clough, Matthew Arnold, Dean Stanley, Lord Derby, Mr. Goschen and Thomas Hughes, whose *Tom Brown's School-Days* is read by boys the world over. See Stanley's *Life of Arnold*. Population 16,830.

Rugs, Oriental. Rug-weaving is a very ancient art that is probably traceable to Egypt and Babylonia. Persia leads in the production of luxurious and beautiful rugs; thence the art spread to Greece, Arabia, Turkey, Afghanistan and India.

The rug in the orient is not only floor-covering but also wall-hanging, bedding and furniture. Not only was it a source of comfort in the home, but it had a prominent place in religious ceremonies and as temple, mosque and church decoration. The Mohammedan has his prayer-rug which he spreads and kneels upon at the hour of prayer, with the point of the design toward Mecca, the direction in which he bows his head. In the far east rugs are used as saddle-bags and trappings for camel and horses. Originally women were the only weavers. Where rugs are not made for the trade, as they are now in parts of Turkey, India and Persia, women still are the sole rug-makers. Each weaver had a special design which was frequently handed down, with few variations, for several generations.

The implements and materials of the rug-craft are very simple, consisting of two long poles hung horizontally on which the warp of cotton or hemp is strung, balls of the various colored yarns used in the design, a rude kind of comb for packing down the pile as it is tied around the warp-threads and a knife or shears for cutting and trimming the pile. An oriental rug is valued according to the number of knots to the square inch, some rugs having as many as 500 knots in a square inch. These knots are all tied by hand, and it is said that a good weaver can tie about three a minute, so that each rug of any considerable size must take years to make. The materials, beside the cotton or hemp warp, are silk, wool from the sheep or goat and camel's hair. The colors are of animal and vegetable origin, being obtained from indigo, madder, larkspur, saffron, henna, valonia and walnut husks, and are rich, brilliant and permanent. The men gather the dye-plants or cultivate them, work them into dye and dye the wool.

The designs of all but the Mohammedan rugs are both derived from nature and from geometric forms that are supposed to have some symbolic significance. The Mohammedan was forbidden by his religion to imitate any forms of nature; so he has been forced to invent designs that either are purely geometric or are extremely conventionalized suggestions of natural forms.

There are at least 14 varieties of Persian rugs, among which are Khorasan, Meshed, Herat, Shiraz, Kirman, Tabriz, Senna, Saraband, Teraghan, Saruk, Herez, Hamadan, Sultanabad and Ispahan. The Shah of Persia in his palace at Teheran has a marvelous collection of antiques, among which is the carpet that belonged to the famous peacock-throne at Delhi. The climax of this art in Persia was the 16tn century. Persian designs are characterized by a floral pattern.

The region of the Caucasus Mountains is prolific in the production of rugs, the art of weaving which was learned from Persia. Their design is pronouncedly geometrical, using the star, diamond-form, square and fretwork. The rugs listed as Caucasian are Daghestan, Cabistan, Tzitzi, Malgaran, Derbend, Kasak, Guenja, Kashmir, Shirvan and Karabagh.

The Kurds combine the designs of Persia and Caucasia in five kinds of rugs known as Persian Kurdistan, Turkish Kurdistan, Sarakhs, Mossoul and Khilim, the latter are without pile and closely woven in beautiful design and color. They are used as rugs, tent-hangings and blankets.

Among the old Turkish rugs are some wonderfully beautiful ones. It is to be regretted that to-day this district is turning out carpets of an inferior quality both in workmanship and color. From Turkey come the Ghiordes, Koulah, Bergamo, Ladic, Yuruk, Milas, Kaisarieh and Turkish Khilim rugs. Turkoman rugs come from Russian Turkestan and are known as Bokhara or Tekke, Khiva or Afghan, Yomut and Baluchistan. The Bokharan rugs are woven exclusively by women. Their design is marked by a beautiful straight-line pattern and their color is rich and harmonious.

In India the weaving is done by the men and boys, while the women are skilled in making of the dye. Tanjore is a prominent center of this industry. The large medallion-center and smaller border in green, blue, crimson and yellow are characteristic of this weave. Beautiful silk rugs come from Tanjore, Masulipatam and Benares. The modern production of Indian rugs is made under the direction of firms who control the industry and sell its output in America and Europe. China also is proficient in the making of rugs, but these are much rarer than the others that have been treated. Consult Langton's *How to Know Oriental Rugs* and Mumford's *Oriental Rugs.*

Rum, a kind of spirit made by fermenting and distilling the skimmings from the sugar-pans, when sugar is made from cane-juice Enough water is added to the skimmings to produce one gallon of rum to every ten gallons of the mixture. Molasses is sometimes mixed with the skimmings, and a poorer quality of rum is made from molasses alone. The color of rum is given after distillation by adding caramel or charred sugar. Rum improves with age, and a quantity of rum, known to be 140 years old, was sold in 1865 for $15 a bottle. The best rum comes from Jamaica.

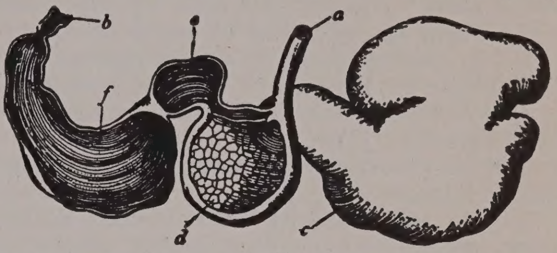
Ruma'nia or **Rouma'nia,** an independent kingdom of southeastern Europe, composed of the two former principalities of Wallachia and Moldavia. It was a part of Roman Dacia, and its people proudly claim to be Romans. It is bounded on the west and north by Austria, on the east by Russia and the Black Sea and on the south by Bulgaria, from which it is separated by the Danube. Its area is 50,720 square miles, and its population 6,865,739. The capital of Rumania is Bucharest in Wallachia (300,000), and the chief town of Moldavia is Jassy (80,000), not far from Pruth River. A remarkable feature in the agricultural system is the ownership of lands by the peasantry, which was introduced about 1864. The peasants had been robbed of their lands during long ages of feudal oppression, and at this time it was determined to restore a portion by permitting them to purchase small tracts by means of a loan from the government. The result was that in 1880 there were in Rumania nearly 500,000 holdings, averaging 10½ acres each, with the greater part of the debt discharged by the owners. In 1859 the two principalities elected Prince Couza as their ruler but in 1866 he was deposed and was succeeded by Prince Charles of Hohenzollern. In 1881 Prince Charles was invested with the kingly dignity as Carol I. He died Oct. 10, 1914 and was succeeded by his nephew Ferdinand

In the European War (*q.v.*) Rumania cast in her lot with the Allies but owing to the intrigues of the Germans who secretly controlled, to a great extent, the affairs of Russia, Rumania was not properly supported and was soon crushed by the German arms and compelled to make peace.

Rume'lia or **Roume'lia** (Turkish *Rum Ili,* meaning Land of the Romans), an important portion of European Turkey, differing widely in area in different times, but most generally applied to the region between the Balkan Mountains and the Aegean Sea, corresponding to ancient Thrace and part of Macedonia.

Rum'ford, Count. See Thompson, Sir Benjamin.

Ru'minant, any cud-chewing animal. The animals belonging to this class are grass and herb-eating forms, as the cow, camel, deer, giraffe and sheep. Those living in a wild state are the favorite prey of large flesh-eating animals. In order to crop their food they must go into open, exposed places; but, as mastication is a long, tedious process, they retire to the shelter of concealed positions to ruminate or chew their food properly. The process of chewing the cud cannot be understood without considering the complex stomach of these animals. It consists of four compartments: the paunch, the reticulum or honeycomb bag, the manyplies and the true stomach. The food when first swallowed is in the form of a coarse pellet which pushes aside a fold in the wall of the œsophagus and goes into the paunch. There it is softened and passed into the reticulum, where it is moulded into pellets of convenient size, which are passed up the œsophagus into the mouth by a process the opposite of swallowing. Here they are carefully masticated and mixed with saliva and then swallowed again. The pellet is now smooth and fine; instead of pushing aside the fold in the wall of the œsophagus, it is guided by it into the third stomach or manyplies. This acts partly as a strainer through which the food passes into the fourth compartment or true stomach. Glands in the walls of this part secrete gastric juice and digestion is carried forward. The camels differ from other ruminants in having no third stomach.



Stomach of sheep. (*a*) Œsophagus; (*c*) rumen or paunch; (*f*) abomasum or reed; (*b*) beginning of duodenum.

Runeberg (*rōō'ne-ber'y'*), **Johann Ludvig,** the national poet of Finland and the greatest poet who has written in Swedish, was born at Jacobstad, Finland, Jan. 5, 1804. His beautiful epic idyl of *The Elk-Hunters* appeared in 1832, followed soon by *Christmas Eve* and *Hanna.* Others of his best works are *King Fjalar* and *Ensign Stals' Stories,* the opening poem of which, *Our Land, Our Land,* has been chosen as the national song of Finland. His poems embody the deepest feelings of the dual people of Finland, of the Finns no less than of the descendants of the Swedish immigrants. Runeberg died at Borga, May 6, 1877. See E. W. Gosse's *Northern Studies.*

Run'ner, a general name given to leafless branches sent out from the main body of the plant, which take root and produce new plants.

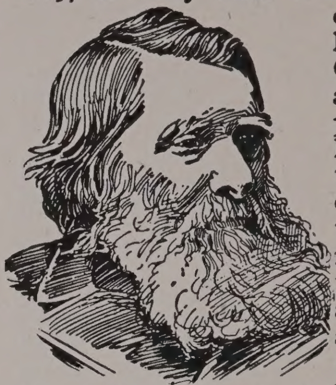
Ru'pert, Prince, 1619-1682, third son of Frederick V, the Elector Palatine, and Elizabeth, daughter of James I of England. He studied at Leyden and served in the Thirty Years' War till he was taken prisoner. In 1642 he went to England in time to take part in the Civil War. For the next three years the Mad Cavalier was the life of the Royalist cause, winning battles by his resistless charges, only to lose them by too headlong pursuit. In 1645 he surrendered Bristol after a three weeks' siege. This so angered Charles that he sent him his passport to leave the kingdom. A court-martial, however, cleared him of all blame and he again became general of his uncle's forces, only to surrender to Fairfax the following June. In 1648 he became admiral of the part of the English fleet that remained true to the king. In 1651 most of his vessels were lost in a battle with Blake. Rupert escaped to the West Indies, where he led a buccaneering life. He went back to Europe, after the restoration and served with Monk against the Dutch. His last ten years he spent in study. He improved the art of mezzotint, discovered an improved gunpowder, invented the composition known as prince's metal and, perhaps, the curious glass-bubbles called Prince Rupert's drops. He was a founder of the Hudson Bay Company and of the Royal Society. See Lord Ronald Gower's *Rupert of the Rhine.*

Rupert's Land. See CANADA, HUDSON BAY COMPANY and NORTHWEST TERRITORIES.

Ru'rik, a Scandinavian adventurer, who in 862 A. D. became ruler or overlord of a part of Russia, with his court at Novgorod, sometimes styled the founder of the Russian monarchy: the Rurik dynasty gave 67 rulers to Russia and lasted 736 years (to 1598). The seventh of the line (Vladimir I, the Great) introduced Christianity; Ivan the Great unified the kingdom and first assumed the title of czar. See ROMANOFF, HOUSE OF.

Rush, Benjamin, 1745-1813, was born near Philadelphia. He graduated at Princeton in 1760, studied medicine, and became professor of chemistry in the Philadelphia Medical College. Dr. Rush was a member of the continental congress and a signer of the Declaration of Independence. He was a founder of Philadelphia Dispensary, the first in America, and of the College of Physicians, and was given several medical professorships besides the one at Philadelphia. During the yellow-fever epidemic of 1793, he was very successful in his treatment. In 1799 Rush became treasurer of the United States Mint. Among his writings, were *Medical Inquiries and Observations, Essays* and *Diseases of the Mind.*

Rural Credits. The Rural Credits Bill became a law May 4, 1916. Its purpose is to provide the farmer with capital at a low rate on long time. For that purpose it established Farm Loan Banks, capitalized by the government. A farmer desiring to obtain a mortgage invests 5% of the amount of his loan in the stock of a Farm Loan Association made up of 10 or more farmers wishing to borrow. The Associations automatically take up the stock of the banks as the number of mortgages increases. The whole system is under the control of a Farm Loan Board consisting of the Secretary of the Treasury and 4 others appointed by the president.



JOHN RUSKIN

Rus'kin, John, born at London, Feb. 8, 1819, the only child of a wealthy wine-merchant. He took his degree at Oxford in 1842, and studied painting under Copley. The story of the earlier years of his life has been told by himself in *Præterita*, one of the most charming autobiographies in any language. In 1843 came the first volume of *Modern Painters*, which treated the principles of art in an independent and even revolutionary way. Though greatly opposed at first, Ruskin's views have largely determined the character of later English art. In 1849 appeared *The Seven Lamps of Architecture* and two years later *The Stones of Venice.* The titles of Ruskin's books often give no indication of the subject. *Notes on the Construction of Sheepfolds* deals with church-discipilne; *The Crown of Wild Olive* consists of four essays on work, traffic, war and the future of England; *Sesame and Lilies*, lectures on good literature; *The Queen of the Air*, on the Greek myths of cloud and storm; *Ethics of the Dust*, lectures on crystallization. From 1869 to 1879 Ruskin was professor of art at Oxford. Ruskin is noted for his splendid style, which for eloquence, power and richness hardly has any equal. In art he tells us that he aimed to set forth the "supremacy of five great painters, despised till he spoke of them — Turner, Tintoret, Luini, Botticelli and Carpaccio." His *Munera Pulveris* deals with political economy, on which he wrote from an independent point of view. See Cook's *Studies on Ruskin.* He died at Brantwood, in the English lake-region, Jan. 20, 1900.

Rus'sell, John, Earl, English statesman, was born on Aug. 18, 1792, at London, the third son of the duke of Bedford. He studied at Edinburgh, and entered Parliament in 1813. In 1830 the Liberals came into power, and, though Russell was not a member of the cabinet, he was one of four who framed the first reform-bill. In 1835 he became home-secretary and leader of the house of commons, and introduced most of the important bills passed at this time. In 1839 he became colonial secretary. In 1846 Russell became

Prime Minister. Famine and rebellion in Ireland and troubles in England beset the ministry, which fell in 1852. In 1859 he became foreign secretary, an office which he held for six years. Among the features of his management of affairs were England's unfriendly tone toward the United States in the *Trent* affair, her taking part in the Mexican expedition, the interference with Russia in favor of Poland and the friendly feeling of England for Denmark during the Schleswig-Holstein War. In 1865 Lord John, now Earl Russell, became Prime Minister for the second time, but kept in power only for a year. He died on May 28, 1878.

Russell of Killowen, Sir Charles Russell, a distinguished British jurist and statesman, was born at Newry, Ireland, on November 10, 1833. He was educated at Trinity College, Dublin. He began his career as a parliamentary leader-writer, and was called to the bar in 1859. From 1880 to 1885 he represented Dundalk, and from 1885 to 1894 South Hackney in the House of Commons, and twice was Attorney-General in Gladstone's administration. Although a Liberal and an ardent Home-Ruler, his political aspirations were subordinate to love of his profession, of which he became a great ornament. He was knighted in 1886. As a sound lawyer, acute cross-examiner and persuasive advocate, Sir Charles long was without a rival at the bar. In 1889 he increased his reputation by his masterly oration at the Parnell Commission, where he was counsel for the great Irish leader. He was one of the English counsel in the Bering Sea arbitration, and also served on the Venezuelan boundary arbitration tribunal. In 1896 he visited the United States and delivered an address on international arbitration before the American Bar Association. In 1894 he was appointed a lord of appeal in ordinary, with a life peerage, and later succeeded Lord Coleridge as Lord Chief Justice of England, which position he held until his death. He was the first Roman Catholic to hold office since the Reformation. He died at London, on August 10, 1900.

Russell, Lord William, an English patriot, was born on September 29, 1639. He was educated at Cambridge and travelled for sometime afterward on the continent. In 1669 he was married to Lady Rachel Wriothesley. In 1674 he spoke in the House of Commons, of which he had been a silent member since the Restoration, against the doings of the Cabal, the famous advisers of Charles II. From this time on he was a leader of the Commons. He believed in the popish plot and carried up to the House of Lords the bill to shut out the Duke of York from the throne. Russell, Essex and Sidney were arrested on suspicion of having taken part in the Rye House plot. By means of infamous witnesses and a packed jury, Russell was found guilty. His father's offer of $500,000 for his life was refused; he would not accept a plan made for his escape; and on July 21, 1683, he was beheaded. Pity for his judicial murder and the letters of his noble wife, who at his trial appeared at court as his secretary, have served to keep his memory fresh as a Christian hero.

Russell, William Clark, an English novelist, was born at New York on February 24, 1844. He is the son of Henry Russell, who composed *Cheer, Boys, Cheer!; There's a Good Time Coming,* and *A Life on the Ocean-Wave.* Young Russell went to sea at the age of thirteen, and served for eight years. The remainder of his life was spent as a newspaper writer and novelist. His sea-tales rank with those of Marryat and Cooper, and are deservedly popular. Among them are *Jack's Courtship; My Shipmate Louise; The Wreck of the Grosvenor; A Sailor's Sweetheart,* and *An Ocean-Tragedy.* Russell died in 1911.

Russia (*rŭsh'ȧ*), or **The Union of Soviet Socialist Republics** (U.S.S.R.), a federation of seven Russian constituent states under Bolshevik control, which came into existence following the dismemberment of the old Russian Empire. The territory to-day embraced by the U.S.S.R. represents only ninety-three per cent of the Czarist Empire, while its population is but eighty-eight per cent of the total population who were subjects of the Czar. Prior to the Revolution of 1917, when the Empire fell to pieces, Russia's boundaries extended over a large part of Eastern Europe and Northern and Central Asia. Its principal divisions were European Russia, which contained three-fourths of the population of the Empire; Finland, Poland, Siberia, Caucasia, Turkestan, and the Transcaspian region, besides the dependent countries of Khiva and Bokhara. To-day the U.S.S.R. has a land area of 8,144,228 square miles, as compared with 8,647,657 square miles comprised in the old empire, one-seventh of the land surface of the globe.

Surface and Drainage. The topography of the U.S.S.R. is distinctly diversified. Vast plains, both desert and potentially productive lands, stretch across the country. High mountain regions and the Russian steppes, broad plains of a shifting sandy formation, relieve the monotony of the plain areas. In the very heart of Russia proper spreads a series of low tablelands which slope gently toward the Baltic, the Black and the Caspian Seas. To the north these tablelands slope in the direction of the White Sea and the Arctic Ocean.

The Ural Mountains, which traverse the country from the southwest to the northeast, form the boundary between Russia proper and Asia. To the south, between the Black and the Caspian Seas, rise the Caucasian Mountains. Extensive forests cover much of Central Russia. The highest altitude reached in Russia is Mount Elbruz which soars 18,465 feet above sea level. The lowest point of the country lies at the Caspian Sea, eighty-six feet below sea level.

The climate of the U.S.S.R. is as diversified as its topography.

Up until the end of the seventeenth century, when Russia won control of the Baltic and the Black Sea shores, the whole Russian seaboard was made up of the Arctic Ocean. To the north, the Arctic Ocean, and the White, Kara, Bering and Okhotsk Seas are especially valuable for fishing and hunting. These coasts are, however, frozen over a great part of the year.

The principal rivers of the Soviet Russia are the Dneiper and the Dneister which flow into the Black Sea; the Volga and the Ural which empty into the Caspian Sea; and the Neva, which flows into the Gulf of Finland. The Petchora River has its outlet in the Arctic Ocean. The Dneiper River constitutes a part of the proposed trans-European waterway which will extend from the Black Sea at Odessa to the Baltic Sea at Danzig. The waters of Russia are extremely important as "actual or potential channels of commerce." Steamers may navigate through Russian waters, including rivers, canals, and lakes, for a distance of 42,091 miles.

Natural Resources. Within the confines of the U.S.S.R. are contained vast material natural resources, including minerals and timber and agricultural lands, all of which have been of inestimable value in enabling Soviet Russia to become self-contained. It has been estimated that approximately 500,000,000 acres of Russia's area are forested. In the Ural Mountains are abundant supplies of gold, silver, zinc, copper, and salt. In 1925 there were rich graphite deposits discovered in Northwestern Siberia. It was in 1928 that the Geological Committee reported the existence of enormous potash deposits in the Solikamsk district in the West Ural region. In the following year exploitation of these deposits was begun. In 1932 new oil fields were discovered in the Southern Urals. Among the country's other important minerals are iron ore, coal, lead and manganese. Under the régime of the Czar, much of Russia's vast resources remained unsurveyed. Since the inception of the Soviet régime, however, an accurate surveyal of the country's mineral resources has been made and exploitation of those resources begun. The known coal resources, for instance, in 1917 totalled 230,500,000,000 metric tons, while in 1932 these resources totalled 1,113,700,000,000 metric tons. The hydraulic resources of the Union were estimated in 1932 at 65,000,000 horse power.

Production and Industry. Soviet Russia is essentially an agricultural country. More than eighty per cent of the population live by the soil. During the Revolution of 1917, Russian peasants seized more than 1,080,000,000 acres of land which had formerly been held by the landowners. Under Bolshevik control agriculture has been submitted to the plan of collectivization. Under the First Five Year Plan approximately 210,000 collective farms were organized. It became imperative to supply trained executives, personnel and machinery to manage these collective farms, in the place of peasants who clung to almost primitive methods of farming as well as primitive machinery, all of which presented seemingly insurmountable difficulties. In view of these conditions the grain harvest in 1931 and 1932 showed a decided decrease as compared with those of 1930. The principal crops under cultivation include rye, wheat, barley, oats, corn, potatoes, sugar beets, sunflower seeds, hemp, flax, tobacco, and raw cotton.

One of the tasks of the all-Union Congress in 1934 was to consider the Second Five Year Plan which was made public on December 30, 1933. The most important feature of this plan is its project for increasing industrial production approximately two and a half times during the five year period from January 1, 1933 to January 1, 1938. The project calls for the doubling of the coal, copper, pig iron and steel output during this period, while the manufacturing of machinery, automobiles, agricultural implements and locomotives is to be increased three times its present rate. About 7,000 miles of railway are to be constructed during these five years and electric power is to be increased 180 per cent. The industrial features of the plan are aimed primarily at increasing the production of goods for popular consumption. The Second Five Year Plan also embraces a cultural program under which facilities for vocational and technical education will be extended and adult and primary education will be improved upon in an effort to promote the intellectual progress of the Russian people. Although the plan may be modified at any time by the Central Committee, it is at present indicative of the progress being steadily made by the Soviet régime. The Congress was given to understand that the Second Five Year Plan was but an attempt on the part of the Soviet Government to increase the material welfare and comfort of the people. Thus the plan differs from the First Five Year Plan which was aimed primarily at creating an industrial self-sufficient Russia. The domestic policy of Russia during 1933 was unusually successful in that the agrarian situation gave distinct signs of improvement. The official grain statistics for 1933 revealed a new record for Russia, exceeding by 10,000,000 tons the production of 1913, the year of Russia's bumper crop. The 1933 crop provides about 7,000,000 tons of grain for export purposes in addition to supplying the needs of the Russian commonwealth. The economic policy of the Soviet Government is based upon the collectivist agrarian organization, which is now regarded as permanent. The government now feels that the food supply of the nation is assured.

Joseph Stalin, Soviet Dictator, leader of the Communist party and a dynamic character in the life of Soviet Russia to-day, was the chief architect of the New Five Year Plan, the success of which the Kremlin is determined to have realized. Stalin declared in his address to the Congress of the Communist party that "the premise of Marxism is that the tastes and demands of the people cannot be the same and equal both in quality and quantity either in the period of socialism or in the period of communism." Society is being transformed under the program of socialism which is sweeping over Russia at the expense of humanity. The transformation cannot always be achieved peaceably. "The 'remains of the parasitic classes' cannot be painlessly absorbed into the new society. More often they must be broken. Not only their economic status is hateful to the Soviet régime, but also—possibly more so—their psychological make-up, their 'bourgeois mentality.' Some 50,000,000 peasants still live and work on an individualist basis, tilling their private plots and using for the most part their own implements. Their collectivization will be attained, but not without overcoming active and passive opposition." This social transformation is an important feature, if not the essential point of the Second Five Year Plan.

Another important aspect of the new plan is the shift of heavy industry from western Russia to the Urals and Siberia. Approximately one-half of the capital investments which have been assigned to heavy industry will go to the Urals and Western Siberia. About one-fourth of all investments will be devoted to the coal and steel interests about Stalinsk in Siberia. By the time the new plan has run its course it is estimated that "one-third of the iron and steel, one-fourth of the coal, one-sixth of the electric energy of the regional power stations and about ten per cent of the machinery produced in the country" will come from this area. Other industrial developments will center about Cheliabinsk and Magnitogorsk. Large tractor works have already been constructed in Cheliabinsk. This shift of industry will bring about the realization of an achievement which Soviet Russia has long been working towards, that is, the economic and geographical centers of Russia will at last be made to coincide.

On March 20, 1934, a decree was issued which changed the Labor Code by providing higher wages for able workers, abolishing the fixed minimum wage and enforcing reductions for inefficient workers. Under the edict "if a worker fails through his own fault to fulfill the plan outlined for him, he will be paid according to the quality and quantity of work done, with no minimum wage. If the plan is unfulfilled through no fault of his own, he must be paid at least two-thirds of the agreed wage." The effect of the decree will reach all the allied republics of the Soviet Union. Inefficiency among workers has been harshly dealt with in Soviet Russia. Strict penalties and even death sentences have been imposed upon workers whose inefficiency has caused delay and disaster in industry. Much that has already been accomplished towards the collectivization of industry and agriculture, and the industrialization of even personal lives, is but an indication of the scope of the Second Five Year Plan.

Transportation. In 1932 there were 51,790 miles of railways in Soviet Russia. In the latter part of 1933, a new railway line was put into operation which connects Moscow with the Donetz Basin. There were 67,000,000 metric tons of freight carried on inland waterways in 1932, although the First Five Year Plan called for the carrying of 77,500,000 metric tons. The Merchant Marine of the U.S.S.R. comprised 346 steamships on July 1, 1933, with a gross tonnage of 246,177; and two sailing vessels of 2,951 gross tonnage.

The Soviet Union has accomplished much in developing the country's airlines. In 1933 the total length of such lines was approximately 36,000 kilometers, while in 1932 the total was 30,500 kilometers, and in 1928, 12,000 kilometers.

Education. Universal compulsory education was introduced into the Soviet Union in 1930. At this time such compulsion was to extend over a four-year period. In 1933, however, the period was extended to seven years. Educational expenditures are charged primarily against the Constituent Republics. Approximately two-thirds of the appropriations are local. In 1932 there were in attendance in the elementary schools of the Union 20,000,000 pupils as compared with 10,502,964 pupils in 1927-28. There were 4,684,000 pupils enrolled in the secondary schools of the country in 1932.

The percentage of literacy in Soviet Russia was estimated at the close of 1932 at ninety per cent. In 1917 that percentage was but 27-30 per cent.

In the institutions of higher learning the enrollment in 1932 numbered 400,000 students. There were 320,000 students enrolled in the workers' faculties; 830,000 in the technicums, and 1,000,000 in the factory and shop apprentice schools. In that same year there was an enrollment of 7,000,000 pupils in the pre-school kindergartens of the country.

A great part of Soviet Russia's decrease in the percentage of illiteracy has been due to the establishment of adult schools and the astounding increase of newspapers throughout the Union. In 1913 there were but 860 newspapers in Russia with a circulation of 2,500,000. In 1932 there were 6,700 newspapers in the country with a circulation of 38,000,000.

Medicine. One of the most outstanding features of Soviet Russia's program of socialization is the extension of that socialization to the field of medicine. Plans are now being formulated for an institution which will be known as the All-Union Institute of Experimental Medicine. This medical center will occupy a site near Leningrad spreading out over 200 acres of ground. It is estimated that the project will cost no less than $50,000,000. Within the walls of this institution scientists will engage in extensive research on the human body and its functions. Ample facilities will be provided for such a vast work. Disease in its every stage will be studied, and preventive measures and treatment will be developed. Industrial diseases and the conditions conducive to the development of those diseases will be thoroughly investigated. Plans are also being made to equip air-conditioned chambers which will be of inestimable value to the medical profession in the study of human reaction to various climes. In these chambers patients will be carefully watched for their reactions to the various climates of Russia ranging from the Arctic to the subtropical. Dr. S. S. Goldwater, Commissioner of Hospitals in New York is acting in the capacity of official adviser to the Soviet Government in the development of this vast project which aims at supplementing and completing the Soviet program of state-wide medical service.

Two British investigators recently completed a report of Soviet Russia's medical service. In Russia the physician of to-day has almost been entirely removed from the field of monetary compensation. "The State has made a gratuitous medical service of an astonishingly complete character promptly available for the vast majority of urban populations, a service which is being rapidly extended to rural Russia; and it has given the whole of this service an admirable turn in the direction of social as well as medical preventive measures."

Population. According to the most recent official census report (1926), the population of the U.S.S.R. is 147,013,600. On January 1, 1933, the population was estimated at 165,700,000. The principal cities of the Union, with their populations (estimated) in 1931, are: Moscow, 2,781,300; Leningrad, 2,228,300; Baku, 575,200; Kiev, 539,500; Kharkov, 521,500; Odessa, 475,500; Rostov-on-Don, 457,100; Tashkent, 421,800; Nizjni Novgorod, 350,300; Tiflis, 347,900; Dnepropetrovsk, 322,800; Stalingrad, 294,500; Saratov, 277,500; Sverdlovsk, 223,300; Samara, 220,400, and Kazan, 202,000.

There are 182 different nationalities represented in the U.S.S.R., and 149 different languages are spoken by its inhabitants. According to the census report of 1926, 52.9 per cent of the total population are Russians; 21.2 per cent are Ukrainians.

Government. The official and supreme organ of authority in the Soviet Union is the All-Union Congress of Soviets which must hold session at least once in every two years. The Congress is composed of representatives of both town and township Soviets and of provincial councils of Soviets. At such times when the All-Union Congress is not in session, the supreme authority of the Union rests with the Central Executive Committee which is comprised of the Council of the Union and the Council of Nationalities. The former is composed of 450 members elected by the All-Union Congress from the representatives of the Constituent Republics. The latter contains 139 members and is made up of representatives from the Constituent and Autonomous Republics, from each of which there are five representatives, and of one representative from each autonomous area.

The powers of the Central Executive Committee are delegated to the Presidium, composed of twenty-seven members, when that committee is not in session. The Central Executive Committee must hold session three times a year. Its functions include the issuance of legal codes, decrees, ordinances and orders, the legislative and administrative work of the Union, defining the varied activities of the Presidium and of the Council of People's Commissors. Any decree of the Presidium and the Soviet Congresses of the constituent states may be annulled by the Central Executive Committee.

The new Federal Constitution of the U.S.S.R. was approved by the All-Russian Central Executive Committee in July, 1923, and ratified by the Second Soviet Congress on January 30, 1924. The Constitution provides for the universal suffrage of all citizens over eighteen years of age. Only those employers of labor "who perform no socially useful work" are denied the right to vote. There is no Bill of Rights contained in the Constitution.

The Constituent Republics of the U.S.S.R. are:

THE RUSSIAN SOCIALIST FEDERATED SOVIET REPUBLIC. Area, 19,757,953 square miles. Population, 100,858,000. Capital, Moscow.

THE WHITE RUSSIAN SOVIET SOCIALIST REPUBLIC. Area, 126,792 square miles. Population, 4,983,900. Capital, Minsk.

THE UKRAINIAN SOVIET SOCIALIST REPUBLIC. Area, 451,731 square miles. Population 29,020,300. Capital, Kharkov.

THE TRANSCAUCASIAN SOCIALIST FEDERAL SOVIET REPUBLIC. Area, 184,492 square miles. Population, 5,850,700. Capital, Tiflis.

THE UZBEK SOVIET SOCIALIST REPUBLIC. Area, 240,388 square miles. Population, 4,447,600. Capital, Tashkent.

THE TURKOMAN SOVIET SOCIALIST REPUBLIC. Area, 491,216 square miles. Population, 1,030,500. Capital, Ashkhabad.

TAJIKISTAN. Area, 145,100 square miles. Population, 822,600. Capital, Stalinabad (formerly Dushambe).

On January 26, 1934, the All-Union Congress of Soviets, representative of the supreme authority of the Communist party in that it may ratify or reject the acts of its party chiefs, held session in Moscow. This was the first meeting of the Congress since 1930. There are many reasons for the enforced period of idleness on the part of the Congress. It is true that the Central Executive Committee had postponed the sessions of the Congress because it believed the party had been "polluted by alien elements" and was not truly representative of Communism. The Committee proposed a "purging" of the party before it should hold session. Enemies of Stalin, who were intent upon defeating the policy of Kremlin, had gained control of the party especially in the northern Caucasus and the Ukraine. There were other reasons, however, for the failure of the Congress to assemble. From 1930-34 the program of the Communist party had accomplished little in the way of success either at home or abroad. When

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LEADERS OF THE SOVIET SHIP OF STATE

The men who guide the destinies of the Union of Soviet Socialist Republics in attendance at the All-Union Congress of the Bolshevist Party at Moscow. Left to Right, seated: G. Ordjonikidze; J. Stalin; V. Molotov; and S. Kirov. Left to Right, standing: A. Yenukidze; K. Voroshilov; L. Kaganovich; and V. Kuibyshev.

the Congress finally assembled in 1934, its activities were shaped to a great extent by a "purging" of membership. "The entire organization in 1933 had passed through a *chistka,* or cleansing of the ranks in which political heresy and private sin were ruthlessly disclosed and summarily punished." The *chistka* is drastic, revolutionary and sweeping in its investigations. "If Bolshevism is a religion, as outside observers so often insist, then the institution of *chistka* is its confessional; a confessional more searching and soul-searing than any ordained by older faiths; a confessional in which there is never any privileged secrecy and rarely any absolutism; in which punishment is not deferred to a hereafter but is meted out on the spot." The *chistka* was successful in so far that it rid the Communist party of undesirable members and brought the party into closer union with the central officials. The "purged" All-Union Congress then, which met in Moscow, unanimously voted approval of the program of its party leaders. The Communist program had indeed accomplished much for Soviet Russia in 1933, particularly in international affairs. The Congress was addressed by Joseph Stalin on January 26. Undoubtedly the most important work of the Congress was centered about the reorganization of the Communist party and a governmental reorganization which would establish a new relationship between the party and the Soviet Government. The Congress advocated a plan, prepared by L. M. Kaganovich, which proposes a revision of the Constitution by which the authority of the Communist party and the government will be identical. Under the present Constitution of the Soviet Union the government of the state has no "organic connection with the actual dictatorship of the country, although the leaders of the Communist party have always dominated the policies of government." Under the new plan there will be two new committees of control created which will be legally operated in connection with the All-Russian Central Executive Committee of the Communist party and the Council of Commissars. The new committees will be entrusted with the selection of party and government officials and the task of outlining party policy. These committees will be elected by the Communist Congress to which body the committees will be alone responsible. Such a step places supreme authority in the hands of the Communist party. In the future all governmental as well as party officials will be loyal Communists. The proposed revision of the Constitution also includes the abolition of the cell and local committee, small local party units, thus destroying all local authority and endowing national leaders with supreme power.

On March 16, an important decree was issued aimed at securing "concrete leadership in all branches of governmental and economic work." The edict calls for the abolition of the committee system in every branch of the government with the exception of the Soviets and legislative committees. This system, which is a symbol of bureaucratic weakness in the Soviet Union, is to be replaced with an individual system of management and responsibility. It is expected that this new system will prove so efficient that at least ten per cent of the workers now employed in the State Office can be dispensed with by the close of the current year and returned to productive labor. The decree also aims at strengthening the connections between the central executive boards and the factories and farms which they supervise. Certain social welfare duties such as home furnishing and food supplies have been assigned to the trade unions by the decree. The decree by no means marks the return of Soviet Russia to capitalism nor does it indicate that individual freedom is being sanctioned by the Government. A distinction must be made between individual responsibility and individual freedom. Under that latter status the individual is free to hold property or to accumulate profits. The decree does signify that a struggle is being waged against a bureaucratic system which has entrenched itself in the organization of government to so great a degree that government has become a complex and not overly efficient group of governmental bodies. The reform now being put under way is "a housecleaning within governmental bodies in order to bring about simplification and efficiency in the organization." A similar drive against bureaucracy was conducted by Lenin in 1921. Many changes have been effected during those thirteen years, but the number of bureaucrats has increased. The real dictatorship of Soviet Russia rests in a body called the Political Bureau.

History. The Russians are a Slavic people who conquered Russia from the west, fighting eastward from the Baltic. The name of Russes, however, was first given to Norse warriors who yearly passed through these Slav lands on their way to enter the Byzantine emperor's service at Constantinople (now Istanbul). These captains seem to have been asked to protect the Slavs, and one of them, Rurik, with three of his brothers, settled there. Vladimir (980-1015) was baptized a Christian, and soon after his death Kieff, the "mother of the Russian towns," rivalled Constantinople in greatness. Under Yaroslav, who gained control of most of the Russian towns and died in 1054, the first written Russian law was compiled. During the next 200 years the Russians steadily conquered eastward. Towns and colonies were founded, which in reality were free republics, the only bonds between the different cities being those of language, race, religion and the unwritten law that the prince who was asked to defend a town should be a descendant of Yaroslav. In this period the trading cities of Novgorod, Pskov and Smolensk rose to importance. Slavery existed, though the workers of the soil were its owners, the slaves either being prisoners of war or those who remained in a servant's position for more than a year. In these years also the *boyars,* the chief warriors, began to gain power, settling the peasants on free lands and making themselves their landlords. Andrei Bogalubski (1157-74) was the prince who changed the center of gravity of Russia from Kieff to the region where Moscow was afterwards founded. He built the city of Vladimir, and plundered and burnt Kieff in 1169. Soon Nijni-Novgorod was founded as a rival of Novgorod, and this region, the home of the Great Russians, grew powerful.

In 1224 the Mongols and Tartars, who under Genghis Khan had conquered Manchuria, North China, Turkestan and Bokhara, won a decisive battle against the Russians on Kalka River. From this time Russian princes paid tribute to the khan; their courts, which now had an eastern appearance, were surrounded by Tartars and Mongols; and it was with Mongol help and armies that the rich rulers of Moscow reduced to their rule the formerly independent principalities around them. The Mongol conquest threw Russia 200 years behind the civilization of the rest of Europe, and gave Poland, Lithuania and Livonia a chance to rise into power.

It was in the fourteenth century under the leadership of Moscow that the Russians first tried to throw off the Mongol yoke. Dimitri Donskoi (1359-89) fought an indecisive battle at Kulikovo, followed the next year by the Mongols for the last time storming Moscow, burning it and killing 24,000 of its people. Ivan III (1462-1505) was the first prince of Moscow to call himself Ruler of all Russia. He conquered Novgorod, and refused to pay further tribute to the khan. A Tartar-Mongol army of 150,000 men, sent to punish him, met the Russians on the Oka, and after a nine months' encampment retreated without fighting, and Russia again was free.

Ivan IV, Ivan The Cruel, was the first Russian monarch to take the title of Czar, and was Russia's first absolute ruler. When at the age of three he ascended to the throne, the *boyars* were all-powerful, and a struggle was forced upon him, in which he was successful. Under Ivan's feeble son Feodor (1584-98), the regent Boris Godunoff forbade the peasants to leave the estates on which they worked and thus sowed the seed which grew into the serfdom that cursed the country for the next 270 years. This regent murdered Ivan's son Dimitri. On Godunoff's death a runaway monk, who lived for some time among the Cossacks ("free men"), imposed himself on Russia as the murdered Dimitri. His assassination at the end of a short reign was followed by the conquest of the czardom by Sigismund of Poland. The country was freed by a general rising, started by Minin, a Nijni-Novgorod merchant, and aided by the Cossacks. The Poles were driven out, and Mikhail Romanov (1612-45), whose grandmother was Ivan's first wife, was chosen ruler.

In the reign of Alexis (1645-76), Russia, chiefly by the aid of the Cossacks, at last gained the upper hand in the long struggle with the rival Slav power of Poland. Up until the reign of Peter the Great (1689-1725), the country had in many respects been Mongol. This able ruler, who first called himself emperor and founded the new capital of St. Petersburg, made it European. He improved the army, started mining and manufactures, imported fine breeds of cattle, set up schools, and dug Russia's great system of canals. The ministers, Menschikoff under Catherine I and Dolgoruki under Peter II, were the real rulers of those reigns. The power of the German party under Anne (1730-40), and Ivan (1740-41) was lost on the accession of Elizabeth (1741-62). Peter III, who by sending his army to the support of Frederick the Great against Austria, saved Prussia from dismemberment, was dethroned by Catherine II (1762-96), whose wars and the first partition of Poland widened Russia's domains in all directions. The excessive tyranny of Paul I (1796-1801), brought about his murder. In the reign of Alexander I (1801-25), the famous friend and enemy of Napoleon, occurred the French invasion and the burning of Moscow. Under Nicholas I(1825-55), was fought the Crimean War. Alexander II (1855-81) freed the serfs and initiated many other reforms, which were brought to a sudden close by the insurrection of Poland (1863), and the rise of the Nihilists, who assassinated him on March 13, 1881. The reign of Alexander III (1881-94), was marked by the famine of 1890-91 and the crusade against the Jews, who were ordered to leave Moscow, Warsaw and other cities and go back to their native provinces. Nicholas II, the former emperor, ascended the throne on the death of his father, on November 1, 1894. His reign was marked by the war with Japan.

Russo-Japanese War, The. From 1904-05 occurred the famous struggle between the two powers which is of great military interest. It not only tested the strength of two powers, with surprising results, but it tested modern weapons of naval warfare in a unique way. Moreover, it marks a great era in the national life of Japan, and seems to presage general awakening of Asia. It concerned England very directly by relieving her of anxiety about India, and by the fact that she was Japan's ally, bound by a treaty of 1902 to assist Japan if a third power should interpose in the hostilities. It affected America vitally, because of the close vicinity both of Japan and Russia to the American shores.

In 1894 Japan had been robbed of the greater part of the fruits of her victory over China by the ultimatum of Germany, France and Russia, which demanded that she should withdraw from the Liaotung Peninsula. Japan submitted, but silently worked until she had prepared a first-class army and navy. In 1902 Russia agreed to withdraw her troops by instalments from Chinese territory. She violated her agreement. In 1903 Japan made certain proposals for a good understanding with Russia. During the negotiations which followed Russia strengthened her army in Manchuria and her navy in the East. On February 6th, 1904, Japan broke off negotiations and recalled her minister from Russia.

Japan struck the first blow by a torpedo attack upon the Russian squadron which lay in the outer roadstead of Port Arthur (February 8th). This attack was followed by a bombardment at long range by the fleet of Admiral Togo on the 9th. Czar Nicholas proclaimed war on February 10th.

The first Japanese army under Kuroki marched from Chemulpo, Korea, across Yalu River and won a victory over the Russian forces near Antung. Kuroki pursued the Russian troops toward Liaoyang, and meantime three other Japanese armies landed on the Liaotung peninsula under Generals Oku, Nogi and Nodzu. On May 21, Oku fought and won the battle of Nanshan Hill, cutting off Port Arthur from the Russian army under Kuropatkin at Liaoyang. The Japanese armies were then divided, Nogi with a strong force going south to invest Port Arthur, while the other divisions joined in an advance on Liaoyang. Stakelberg with a Russian force of 35,000 men was sent south to the relief of Port Arthur, but was met and defeated with heavy loss by the Japanese under Oku. Kuropatkin, with 170,000 men and 400 guns, was attacked by Liaoyang by the combined armies of Kuroki, Oku and Nodzu, numbering 200,000 men and 500 guns under the chief command of Marshal Oyama. The battle lasted from August 26, until September 4, and resulted in the defeat of the Russians with a loss of more than 22,000 men. Kuropatkin halted at Sha River, and here on October 9-11 he attacked the Japanese and was defeated, losing nearly 70,000 men. The active siege of Port Arthur began about August 1st, 1904, the Japanese force under Nogi numbering more than 100,000. Desperate fighting occurred from time to time until a hill was captured by the Japanese, from which they could see the town and harbor of Port Arthur. They were thus enabled to get accurate range and shell the town and harbor until the Russian warships in port were sunk and the town in large part destroyed. Port Arthur was surrendered by Stoessel on January 1, 1905, with 32,000 prisoners. Nogi's army now joined Oyama's forces and the battle of Mukden was fought, beginning Feburary 24 and continuing until March 12. This proved to be one of the greatest contests in history. Marshal Oyama had nearly 450,000 men and Kuropatkin about 410,000, the total number engaged being estimated at 860,000. The battle resulted in another victory for the Japanese, the Russian loss being nearly 110,000 men, in killed, wounded and prisoners. The loss of the Japanese was estimated at 75,000 men. No serious fighting on land occurred after this battle. Meantime Russia sent a powerful fleet from the Baltic under the command of Rojestvenski. This fleet, sailing for Vladivostok, was attacked and destroyed in the Sea of Japan on May 27th, by the Japanese fleet under Togo. On the invitation of President Roosevelt of the United States, a peace conference was held at Portsmouth, New Hampshire, opening on August 9, 1905, and here a treaty of peace was signed on the 23rd of August, 1905. By this treaty Russia's lease of Liaotung Peninsula, including Port Arthur, was assigned to Japan and Russia also ceded to Japan the southern half of the island of Sakhalin.

Soviet Russia. In 1917 occurred the Bolshevik Revolution. Nikolai Lenin, former member of the Russian legislative body, the *Duma,* who had fled to Switzerland in 1903, after accepting German financial aid, returned to Russia. Lenin and Trotsky, the military leader, overthrew the Kerensky Socialist government, defeated the old Russian or "White" forces under Wrangel, Kolchak, Denikin, and others, and established a Bolshevik government with Lenin as President. Refugees fled from Russia, including 200,000 "White" soldiers, who took refuge in Rumania, Bulgaria, Czechoslovakia, Serbia, Greece, Germany, Poland, and France. The Slavs rejoiced, both peasants and intellectuals feeling that a new freedom was in store for them.

In 1918-21 there arose a Red rule by a Soviet despotism more cruel than any other governing body in recent times. Thousands of anti-soviets were murdered. All private property was seized and placed under the control of the government, in accordance with the principles of communism. The defense offered by the Soviet or council bodies was that absolute despotism is necessary for a time, until Sovietism established itself. Famine and squalor followed the communistic regime. Foreign nations, especially the United States, assisted stricken communities, although the aid was sometimes hampered by refusal of the communistic bodies to permit assistance. Hundreds of thousands died from hunger and exposure. Soviet ruthlessness crushed tyranically any opposing forces. Capital diminished, industry stagnated.

In 1922 Lenin changed somewhat his communistic principles, and established what is known as the New Economic Policy (N.E.P.). This policy permitted a certain degree of private ownership. The policy was adopted so that foreign capital would be invested in Russian enterprises. Those permitted to invest their own money, own their own shops, and receive their own profits without government interference were called "nepmen." Shops sprung up and peasants planted more grain. (Before this time, the peasants planted only what they would need for themselves as the government took all surplus. The result was famine.) With individual initiative recognized, there were evident signs of recovery both in the cities and on the farms. On the other hand, imperialistic, tyrannical, soviet or council rule continued.

In 1923, the nepmen—those engaged in their own business—were successful in underselling the communistic or government shops, and still make a profit, primarily because the government shops lacked individual initiative, and involved unnecessary detail of operation, thus preventing the practice of economy. The government, afraid this new condition would give proof of its false economic policy of government ownership of everything, levied extra heavy taxes upon the newly developing private concerns, which partially crushed economic recovery.

Nikolai Lenin, the man who organized the Bolshevik party in 1903, and operated from the security of Switzerland until 1917, died in Moscow in 1924. It was he who accepted German money during the World War to bribe the Russian Army, assisting in the fall of Russia under the Czar. A firm believer in Communism, he became the virtual dictator of Russia from 1917 until his death. St. Petersburg was re-christened Petrograd at the beginning of the World War; at Lenin's death it was re-christened Leningrad.

Great Britain recognized Soviet Russia in 1924; Austria, Norway, and Italy followed the British lead. Japan recognized the nation in 1925.

Upon the death of Lenin, on January 21, 1924, Alexis Rykoff Ivanovitch became his successor. His real titles were President of the Council of Commissars, and President of the Russian Federated Socialist Republic.

To-day it is quite necessary to be born of peasant folk—that is, if one must be born in Russia. But this was not the case in 1881, when Alexis Rykoff was born of Russian peasants in Saratov.

Under the régime of the Czar, Rykoff's life was far from happy. As a youth he made friends among the opponents of the throne; he became a marked man. In 1900 he attended a second-class university because he was not permitted to enter the better universities. However, it did not matter much, for in a few months he was seized because he was a member of the Social Labor Party.

From this time on he played hide-and-seek with the Royal Russian police. Sometimes he would be exiled; once in a while he would escape. On one occasion, in the dead of winter, he fled a northern prison by travelling several hundred miles over the Arctic Ocean.

After having been seized and thrown into prison several times, Rykoff decided that if he were ever to enjoy freedom to study economics in a university, he had better leave the country. It was in 1903, that he went to Geneva, Switzerland. There he met Lenin. An enduring friendship followed. For the next fourteen years they worked together—that is to say, when Rykoff was not in prison.

Then came the year 1917. Rykoff returned from a forced exile in Siberia and joined Lenin. Soviet Russia was established.

Lenin captured the people's fancy; Rykoff tried to put the ideals of Lenin into practical workable form.

When Lenin became ill in 1922, Rykoff assumed the duties of the premiership unofficially. Thus he knew the job thoroughly by the time his master died.

Rykoff was a much less dominant man than his friend Lenin. When chosen President he was not known by peoples generally in countries outside Russia. He worked quietly, and even the Russian peasant seldom thought of him. It is probable that the heads of Russian Sovietism would never have elected him to his present office had there not been so much dissension among themselves. Internal strife and dissension were raging and the inhabitants naturally chose a more or less non-combatant Rykoff, an economist, more temperate than some of the more fanatical Soviets.

The Union of Soviet Russia has come to occupy a dominant position among world powers to-day. An American-Russian rapprochement has been accomplished, Russia's battle for developing an industrial state without the benefit of long-term loans has ended and the Soviet Union has won recognition by leading nations of the world. Soviet Russia has thus been enabled to assume an important rôle in world affairs. To-day the Soviet Government is confronted with a most pressing problem. War is impending with Japan. Japanese encroachment in the Far East has aroused Soviet Russia to a state of armed resistance. A political struggle of major importance has been in progress in the remote regions of Chinese Turkestan. Since 1924 the Soviet Government has maintained a dominant influence in Outer Mongolia. A federated tribal government, under the control of Russian advisers, has maintained peace and order in this region for more than a decade. A Chinese influence, which antedated Russian control, has been almost completely eradicated.

A revolt broke out in Outer Mongolia in the latter part of 1933. It is believed that Japan provoked the outbreak, a belief which has been substantiated by reports that Japan seeks to include the vast regions of Outer Mongolia and Sinkiang in her new mainland empire. Her expansion has thus far met with little opposition from China, but Russia has exhibited no little concern and strenuous resistance to the Japanese program. Soviet Russia dispatched a special cavalry force to Outer Mongolia which successfully suppressed the insurgents and defeated Japan's first attempt to establish her power in this region. Russia to-day is determined to maintain the control which has increased rapidly since 1929 when the Turk-Sib Railway was completed. The Soviet Government realizes that for reasons of security she must maintain her control in Chinese Turkestan and remain on friendly relations with the governments of the Far Eastern border. Should Japan extend her influence into this territory, the security of Moscow would be seriously shaken. Japan has already penetrated into Inner Mongolia and Soviet Russia is resolute in her conviction that Japanese encroachment must cease. Nor has Russia been secretive about her intentions. Officials of the Soviet Government and the press have been quite free in disclosing information concerning the mobilization which is being carried on near the Eastern frontier, the new fortifications on the Siberian frontier and the Maritime Provinces which extend along the Pacific Coast from the frontiers of Korea (Chösen) to the Arctic Ocean, and the development of the air force in this area. The Soviet Government is also providing for construction of additional and more adequate communications in the Far East. Emigration to the Siberian provinces is being promoted by the Government. Attempts are also being made to stimulate industry in this area. On February 5, 1934, an edict was issued extending the decree of December, 1933, by which the inhabitants of the Maritime Provinces were exempted from those forms of taxation which had been too heavy a burden upon them. Under the February edict other Siberian districts were included in this category. Until 1940 no compulsory grain deliveries will be required of collective farms. This same regulation applies to the peasants for a three year period. The decree also increased the wages of labor, industrial and professional, in this area; increased the wage of soldiers on duty in the Far East fifty per cent; increased the food ration, and increased the pay of army officers twenty per cent. The widespread activities of the Soviet Government in the Far East have been interpreted by many as indicative of a desire on the part of Soviet Russia to propagate its power and impress Japan and the rest of the world of its capabilities. Few nations regard Russia's activities as necessarily a forewarning of a Russo-Japanese war in the very near future. Nevertheless the existence of armies of both countries, each hostile to the other, on the Eastern frontier is an increasing menace to peace. On February 23, 1934, at the sixteenth anniversary celebration of the Red Army, the danger of impending war was deeply stressed.

One of the most outstanding successes of the Soviet Union in 1933 was the negotiating of a recognition agreement with the United States. The Soviet Government promptly appointed Alexander Antonovich Troyanovsky as the Soviet Ambassador to Washington. On March 23, 1934, Leonid Tolokonsky, Soviet Consul-General, assumed the duties of his office as representative of the Russian Government. Mr. Tolokonsky has been assigned to New York. He is the former secretary of the Soviet Embassy in London and former attaché of the Soviet Embassy in Poland. One of the chief phases of American-Russian relations was the agreement by Russia not to permit its agents

THE AMERICAN EMBASSY IN MOSCOW © *Acme*

The residence and administrative offices of the American Ambassador, William C. Bullitt, are situated in the Spaso-Piskovskaya on the outskirts of Moscow.

to propagandize against the government of the United States. Recent evidence that the communist internationale has not the slightest intention of discontinuing revolutionary activities in the United States has been revealed in the United States. According to reports of Commissar Joseph Aronovitch Piatnitzski the Comintern, under the leadership of Joseph Stalin, is steadily increasing its importance abroad. The executive committee of the Comintern is at present drafting a new and more extensive program for the American and other sections of the party.

Speculative trading in both agricultural and manufactured products is on the increase throughout the Soviet Union, despite the many efforts which have been put forth to abolish a practice which the government regards as an evil. Trade between town and village has been impeded by three hindrances: (1) workers' coöperatives frequently bid against each other and pay higher than fixed prices for agricultural products from collective farms; (2) consumers' coöperatives are not supplying collective farmers with the manufactured articles demanded by this group and as a result the collective farmer buys from the middleman; (3) middlemen and speculators operate on a modest scale, and in increasing numbers, with both agricultural products and manufactured articles.

Instances of speculative trading are being reported in government newspapers and particularly in the *Pravda,* the Communist party newspaper. It has been commented that the government can take no steps to prevent speculative trading until distribution becomes more efficient. An efficient system of distribution would destroy the need of city workers to buy from coöperatives and the collective farmers reliance upon consumers' coöperatives. Many complaints concerning poor distribution are heard daily and the press is inclined to uphold the belief that this condition is more a result of inefficient distribution than an actual shortage of goods.

In foreign trade Soviet Russia has been most fortunate. On March 15, 1934, Sweden accorded the Soviet Union with a cash credit of 100,000,000 crowns ($30,000,000) for the purchase of Swedish goods. The grant from Sweden is significant in that it definitely marks the end of Russia's struggle to develop itself industrially without the benefit of long-term loans. The credit granted by Sweden is to be repaid over a two-year period beginning on August 15, 1939. It provides, if approved, for the first sale of Soviet Government bonds to another government since 1917.

The Soviet Government has also concluded agreements with France and Great Britain. The Anglo-Soviet Agreement was signed at the British Foreign Office in February, 1934, and approved in March by the British House of Commons. It marks a new step in international trade, an experimental step. The solution to the problem of satisfactorily concluding a trade agreement with Russia lay in finding some basis on which trade with a country in which all foreign trade, commerce and production are under State monopoly could be established. It is believed that the new Anglo-Soviet Trade Agreement establishes such a basis. It is aimed primarily at protecting Canadian timber against the competition of Russia and protects the preferences listed in the Ottawa Agreement. The pact stipulates that the proceeds of Russian sales in Great Britain shall be spent in Great Britain, although the type of goods Russia must buy is not mentioned in the agreement. No provision has been made in the agreement for a loan, but it does specify that trade between Great Britain and Soviet Russia will be eligible for export credit facilities on exactly the same basis, both commercially and financially, as is trade with other countries. This pact between Soviet Russia and Great Britain is but a temporary commercial agreement.

On March, 1934, a Soviet-German trade pact was concluded which, it is believed, has settled the debt issue between the two nations, although an expansion of Germany's trade with Russia seems doubtful. The details of the agreement are as yet unknown, but it is generally believed that since Germany is at present unable to offer Russia long-term credits she cannot rely upon Russia as an export market in which to adjust her unfavorable trade balance. Germany's foreign trade is stagnating while Russia today has many foreign claimants for her trade.

On March 7, 1934, William C. Bullitt arrived in Moscow to take up his duties as American Ambassador to Soviet Russia. He resides in the new American Embassy which is situated in Spaso-Piskovskaya. His arrival was marked as a historic occasion in Moscow. Ambassador Bullitt immediately set about making a study of Russian affairs.

Plans are now being developed by which it is hoped to increase trade relations between the two nations. The Soviet Government contemplates sending a trade mission to the United States to investigate the possibilities offered by the American Export-Import Bank for increased Russian trade. The Bank, at the head of which is George N. Peek, has a capital of $11,000,000 which has been subscribed by the RFC (Reconstruction Finance Corporation). Although it is believed that this institution is capable of financing trade between Soviet Russia and the United States up to $100,000,000, Ambassador Bullitt is inclined to believe that a definite trade agreement must be concluded between the two countries before any trading on a large scale can be hoped for. On March, 1934, directors of the American Export-Import Bank resolved to permit no actual credit transactions with the Soviet Government until after a satisfactory agreement has been reached upon the Russian-American debt question. Both Soviet Russia and the United States have been accustomed to maintaining a substantial balance of trade. It was thought that the principle of an export-import parity, which the Soviet Government has thus far applied in its trade relations, would set up somewhat of a barrier to trade relations with the United States. On March 13, 1934, S. S. Shipman of the Amtorg Trading Corporation assured export managers in New York, that the exact carrying out of this principle will not be applied to each individual country with which Soviet Russia establishes trade relations even though the Soviet Government must maintain an ultimate balance of exports and imports. The chief imports of the United States from Soviet Russia are furs, manganese, platinum, caviar, vodka, wine, pulpwood and anthracite coal.

Soviet Russia, like the rest of the world, is making a desperate attempt to stimulate her foreign trade in an effort to reconstruct her economic machinery, a step which must be recognized by any nation as necessary if full economic recovery is anticipated.

Rust, the coating produced on various metals by corrosion. Neither wrought iron nor steels nor cast iron can be exposed to moist air without rusting. Wrought iron, however, being nearly pure iron, rusts more readily than either of the others, which contain carbon. When a drop of rain falls on a clean, bright surface of iron, for a short time the drop stays clear, showing the bright surface of the iron through it. But soon a greenish appearance, which is a precipitate, is seen in the drop, and quickly becomes a reddish-brown—the peroxide of iron. This is rust. The rust does not stick to the iron but is hung in the water, and becomes a coating only when the water has evaporated. Iron remains quite free from rust in an atmosphere containing water-vapor, as long as the water-vapor does not condense as liquid water on the surface of the iron. When rust once forms, however, the iron will go on rusting in an atmosphere in which a piece of clean iron will not rust, because liquid water will condense on rust when it will not on bright iron. It is therefore much easier to prevent the first formation of rust than to stop the process. To prevent rust, oil-paint is used, also a zinc coating (galvanizing) and japanning.

Rust (in plants), a destructive disease caused by the attacks of parasitic fungi, especially injurious to wheat, oats and other cereals. Signs of the disease are spots and lines of black, yellow or brown on stem and leaf. It is one of the most formidable pests that attack grain, annually causing enormous loss. Little progress has been made in combatting it. Varieties that ripen early are less subject to attack.

See ÆCIDIOMYCETES.

Ruth, a young Moabitess, who, after the death of her Hebrew husband, Mahlon, for the sake of her mother-in-law, Naomi, came to settle in Bethlehem. There she became the wife of a near kinsman, Boaz, and the mother of Obed, grandfather of King David. The story is told in *Ruth,* and is placed "in the days when the judges judged," about a century before the time of David.

Rut'land, Vt., is on Otter Creek, close to the Green Mountains and 67 miles southeast of Burlington. The main business is quarrying and working marble. There also are foundries and railroad-shops and it has the state workhouse, two libraries, two homes for the aged, a convent, Masonic Temple, Shriner's Home and the Howe Scale-Works. Its marble quarries are the best in the state, and yield fine white blocks equal to the statuary marble of Carrara. The town was settled in 1770, and was one of the state capitals from 1784 to 1804. It became a city in 1892. It is the second city of Vermont in population and wealth as well as the most important railroad-center. Population 16,000.

Ruwenzori (*rōō-wĕn-zō'rē*), a mountain in the center of Africa, just north of the equator, between Lakes Albert and Albert Edward. It was discovered by Stanley in 1888, and is thought to be 19,000 feet high. Its top is always covered with snow. Stanley thinks this peak and some neighboring ones — Mount Gordon Bennett and Mackinnon Peak — are the mysterious Mountains of the Moon, which geographers of the middle ages put on their maps of Africa, but which modern search has been unable to discover.

Ruysdael (*rois'däl*), **Jakob,** the greatest Dutch painter of landscape, was born at Haarlem about 1625. He loved to paint forest-glades with oak-trees, sleeping pools beneath groups of trees, with an old picturesque building, a mill or a ruined temple or a glimpse of a distant town; a waterfall with rugged rocks; and coast-scenes where earth and water meet. He died in Haarlem's almshouse on March 14, 1682.

Ruyter (*rī'tẽr*), **Michael Adrianszoon de,** Dutch admiral, was born at Flushing, Holland, March 24, 1607, of poor parents who sent him to sea when only 11. When war broke out between Holland and England in 1652, a fleet was given to Ruyter. With it he beat off an attack by the English, and attacked Admiral Blake off the mouth of the Thames, but was forced to retire. Two months later he totally defeated Blake off Dover. When Tromp was killed off the Texel in 1653, Ruyter was made vice-admiral. For service in 1659 he was ennobled by the king of Denmark. The years 1661–3 were taken up in checking the piracy of the African states on the Mediterranean. War again broke out between Holland and England in 1664, and in 1666 Ruyter fought four days against Monk and Prince Rupert, finally driving off the British fleet, but a month later was driven back to Holland. In 1667 Ruyter threw London into turmoil by sailing up the Medway as far as Rochester, burning English ships, and entering the Thames a second time as high as Gravesend, besides attacking Harwich. In 1672 the Dutch admiral fought the French and English in Solebay, and twice defeated Prince Rupert and D'Estrées. After this defeat England made peace. In 1676 the Dutch-Spanish fleet fought the French on the east of Sicily. Ruyter was wounded, for the first time in his life of battles, and died a week later, April 29, 1676. Ruyter was a man of piety, simple in his manners and of unflinching courage. As a seaman he ranks with Nelson and Blake.

Rye, the well-known species of *Secale cereale*, a grass which probably is from western Asia. It closely resembles and is related to wheat. It is a hardy grain and is grown in cool regions. In northern Europe it is a most important crop, being used there largely in bread-making. In the United States it is used chiefly in the manufacture of malt and spirituous liquors. Russia produces the most rye, her crop in 1910 being 867,622,000 bushels, Germany coming second with 413,802,000 bushels. In the United States rye is fifth of the cereals in importance, the crop of 1910 being 33,039,000 bushels.

Rye-House Plot. In 1682-3, while a scheme was formed among the leading Whigs of England to raise the nation in arms against Charles II, another scheme was planned by a few fiercer spirits of the party to waylay and kill the king. It was to be carried out at a farm near Hertford, belonging to one of the plotters, called Rye-House. The plot failed because the house at Newmarket, where the king was staying, caught fire accidentally and caused Charles to leave sooner than intended. Both the greater and the less conspiracy were discovered before long. Though Monmouth, Russell and other Whig leaders had nothing to do with the Rye-House plot, the indignation aroused by it throughout the country took in the whole party. Russell, Sidney and Walcot, the last being of the plot, were brought to the block.

Ry'erson, Adolphus, was born in Norfolk County (Ontario) in 1803, ordained as a Methodist minister in 1825, and founded *The Christian Guardian* in 1829. This paper still is the recognized organ of the Methodist Church, and has continuously wielded great influence. Dr. Ryerson was appointed principal of Victoria College, Cobourg, in 1844 and chief superintendent for education; and examined the educational institutions of Europe in 1844-5. In 1846 and subsequent years he laid the foundations of a system of public-school education, which is the pride of Ontario. He died at Toronto on Feb. 19, 1882.

Ryswick (*rĭz'wĭk*), **Peace of,** was signed at Ryswick, a Dutch village two miles south of The Hague, by France, England, the Netherlands and Spain on September 21, 1697, and by Germany on Oct. 30. The treaty wound up the bloody contest of nearly nine years between France and the allies, which had been carried on since 1688.

S

S (*ĕs*), the nineteenth letter of the English alphabet, is a consonant, often called a sibilant because the true *s* is a hissing or voiceless consonant. Its proper sound occurs in *best, hiss, so.* It also has the sounds of *z*, as in *has; sh*, as in *passion, sensual, version;* and *zh*, as in *visual.* At the beginning of words *s* generally has the hissing sound, but at the middle and end its sound is determined by custom. In a few words *s* is silent, as *aisle, débris, island, isle.* The nearness of *s* to *th* caused *th* in verbs to become *s*, as *loveth, loves.* *S* sometimes changes to *st*, as *hoist* from *hoise.*

Saar Basin, a mandate territory, lying between France and Germany, which was created by the Treaty of Versailles out of the two German states of Prussia and Rhenish Bavaria. It has an area of but 726 square miles, an extremely small tract of land, but one which is commanding the attention of the entire world today since it is the present source of Franco-German friction. This "child of the League of Nations" is the one outstanding problem of Europe at the present time. The purpose of creating such a mandate as the Saar was to provide a neutral territory around the Saar coal mines which were awarded to France by the Treaty of Versailles to compensate for the destruction of the French mines during the World War. This grimy, rugged territory, abounding in rich coal mines and thriving pottery industries, is the home of about 830,000 people dwelling in squalid and sordid villages grouped about the mines, under the suzerainty of the League of Nations which guarantees the citizens of the Saar religious and political liberties. Although the population is predominantly German, the fate of its future nationality is dependent upon the outcome of a plebiscite to be held in 1935. At that time the inhabitants of the territory will choose whether the Saar Basin shall remain a mandate territory under the League of Nations, whether it shall be annexed to France, or return to Germany. Until that time the Saar territory is governed by a League of Nations commission which is composed of five members representing France, Germany and three neutral nations. The British diplomat, G. G. Knox, is president and virtual dictator of this commission. The idea of a commission government for a disputed territory has proved an interesting experiment. The inhabitants have enjoyed a new freedom in living. The Saar has no army, consequently no military service is exacted of the people. Having no army to finance, taxes have remained at a low rate, a blessing to the common working man. The benefits reaped by the citizens of the Saar under the working of an experimental government are expected to bear great weight in influencing the votes of the people in the plebiscite of 1935.

The Franco-German friction over the disputed territory of the Saar has been brewing for several years. It was not, however, until the advent of Hitlerism in Germany that the conflict became a problem of concrete rather than abstract importance. Up to that time it was generally believed that at the plebiscite to be held in 1935, the Saar would vote to return to Germany. With the outbreak of Nazism and its accompanying terrorism in Germany, the Saar population, which is predominantly Roman Catholic, ceased to look approvingly upon a return to Germany. A fear of Nazi suppression assailed them. Recent months have also disclosed the attitude with which the Socialist and communist workers of the Saar regard a reunion with Germany as being decidedly unfavorable. The unrest manifested by the discontented group in the Saar paved the way for French propaganda. France does not want to annex the Saar Basin, but she is anxious for the Saar population to vote for a perpetuation of the present League of Nations régime. Germany, on the other hand, is especially anxious to have the Saar return to Germany immediately, believing it unnecessary to wait for the plebiscite of 1935 to decide that question. Firmly convinced of the soundness in pursuing such a policy, Germany opened tentative negotiations with France for the purchase of the Saar mines and the immediate holding of the plebiscite. The attempt to reach any decision failed, and Nazi agitation in the Saar was begun in earnest.

The Nazis regard the Saar as truly German, and that the Germans in the Saar, the League of Nations, and President Knox himself should be loyal subjects of Hitler in the third Reich. They felt that extreme agitation was necessary in an effort to freshen the loyalty of the inhabitants. As Nazi terrorism and power steadily grew in the Saar territory, the intervention of the governing commission became necessary in order that the League of Nations might fulfill its guarantee to the citizens of the Saar of political and religious liberties. The striking ability of President Knox was expertly displayed by his drafting of a drastic program of repression against Nazi propaganda. Germany's reaction to the repression program was an attempt to reopen negotiations with France for the immediate return of the territory to Germany and the abandonment of the plebiscite. France rejected the German proposals and the question was brought before the Council of the League of Nations at the meeting which convened at Geneva early in 1934. Germany declined to take part in the discussions or arrangements pertaining to the Saar problem which followed. In January 1934, the Council appointed a committee to investigate existing conditions in the Saar which may prevent a plebiscite from being fairly conducted in 1935. The committee is composed of representatives from Italy, Spain and Argentina. Its report will be heard at the meeting of the Council in May. An understanding between France and Germany on this irritating problem seems impossible. Meanwhile the rest of the world has become an anxious spectator awaiting the plebiscite of 1935, the decision of which, should it be opposed to Germany's hopes and demands, will create new strife in Europe.

Sabbath (from *shabath,* to rest), the seventh day of the week, was set aside in the Hebrew Scriptures as a day of rest and devotion. It was observed by the Hebrews after the Exodus in commemoration of their deliverance from bondage (*Deut. v:15*) and perhaps preceded the Sinaitic legislation which merely confirmed its observance. The "Remember the Sabbath" of the Decalogue was followed in the giving of the laws by many regulations for the day, prohibitive of various forms of labor, and by commands to keep certain observances. The day was significant of the finishing of creation, of freedom from bondage and as a token of covenant. In the Epistles of the New Testament the keeping of the Jewish Sabbath is left optional with Christians (*Col. II:16-17*), who are exhorted to observe the first day of each week as the Lord's Day (*Rev. 1:10*), in commemoration of the Resurrection. The medieval schoolmen taught that the observance of the Lord's Day superseded the observance of the Sabbath by ordinance and custom of the church rather than by divine law.

Sabine (*sȧ-bēn'*) **River,** rises in Hunt County in northeastern Texas and partly forms the boundary between Louisiana and Texas. It enters Sabine Lake, then, through Sabine Pass, the Gulf of Mexico. It is 500 miles in length, and navigable for small boats. The drainage area of the Sabine is 20,440 square miles. Possession of this river was one of the historic boundary questions between Spain and the United States.

Sabines, one of the chief ancient Italian peoples who lived first among the central Apennines, but afterwards reached down into the western plains, even to Rome itself. According to the story, a colony of Sabines occupied the Quirinal Hill in Rome, but were at last joined to the Latin followers of Romulus on the Palatine Hill, and so helped to make the Roman people. It is said that Romulus, finding it difficult to get wives for his followers, who were scorned as runaways and criminals, invited the Sabines to a feast and games. While the games were being conducted, the garrison of the Palatine seized the unsuspecting women, whom they carried off to be their wives. This is historically famed as "The Rape of the Sabines." After several wars the Sabines outside of Rome were conquered in 241 B. C. In the Social War of 90 B. C. they demanded Roman citizenship, and at once their amalgamation with the nation began.

Sable. See MARTEN.

Sable Island, a low-lying crescent-shaped island in the Atlantic Ocean, is situated 100 miles south of Cape Breton, Nova Scotia, to which it belongs. It is made of two sand-ridges, with a lagoon between them. The island has been called the sailor's grave, from the many shipwrecks of which it has been the scene. Since 1873 three lighthouses have been built, of which two have been swept away and one undermined, as the island is fast sinking. Early in the nineteenth century it was forty miles long, but now it is not more than twenty. Near it are sandbanks and valuable fisheries. Cranberries and scrubby grass grow on the island. In 1901 more than 80,000 trees were planted by the Government of Canada, to check the shifting sands. The sand bars, which extend for about twenty miles, are a constant menace to vessels. It has been estimated that more than 200 ships had been wrecked here up to the year 1915.

Sackett's Harbor, a village of Jefferson County, New York, is situated on a bay of Lake Ontario at the mouth of the Black River, twelve miles west of Watertown. The harbor is one of the best on the lake. It is a typical military town. Madison Barracks, regimental headquarters, and a naval station are located here. In the War of 1812 Sackett's Harbor was the headquarters of the northern division of the American fleet, and several war vessels were built here. It was twice attacked by the British, who were driven off. Fort Tompkins Park is the scene of one of these battles. Sackett's Harbor is one of the popular summer resorts. The population in 1930 was 742.

Sacramento (*săk-rȧ-mĕn'tō*), the capital of the State of California, and the seat of Sacramento County, is situated on the eastern bank of Sacramento River at the mouth of the American, ninety miles northeast of San Francisco. The main public buildings are the capitol, the courthouse, hospital, postoffice, a Roman Catholic Cathedral, Crocker Art Gallery, and the Masonic and Odd Fellows' Halls. Among the chief industries are flour and planing mills, carriage, harness and broom factories, potteries, automobile, rivet and pipe works and a cannery. In Sacramento are the shops of the Southern Pacific Railroad, employing 3,000 men.

and also the Western Pacific shops. Sacramento was settled in 1839 by a Swiss, who built a fort in 1841. It was not till 1848, after the discovery of gold, that the city, at first a town of tents, was laid out. It became the capital in 1854. Population 120,000.

Sacramento, the largest river of California, rises in the northeastern part of the state, and flows southwest through the Sierra Nevada to Shasta, south to Sacramento and thence southwest into Suisun Bay, through which its waters pass into San Pablo Bay and to the Pacific. It is about 500 miles long, and is navigable for small boats to Red Bluff, nearly 250 miles. Its chief branch is the San Joaquin.

Sacs and Foxes, Indian tribes which settled near Green Bay, Wis. They lived and usually acted together. Both belong to the Algonquin family. Among the Sacs the children of each family at birth are marked white or black in turn, thus dividing the tribe into two bands, the white or Kiscoquah and the black or Oshkosh. The Foxes also were in two branches, the Outagamies (foxes) and the Musquakink (men of red clay). Both tribes were daring and warlike, fighting courageously the much more numerous Iroquois and Sioux. The French had no greater enemies and the English no greater friends than the Foxes, who attacked Detroit in 1812, and were cut to pieces at Presque Isle on Lake St. Clair, to which they had retreated. The Sacs on the whole favored the English, serving under Pontiac, supporting the British in the Revolutionary War and fighting under their renowned chief, Blackhawk, in 1832 to recover their hunting grounds from the United States. In 1857 a party of 317 Sacs and Foxes bought lands at Tama, Ia., which they have worked, becoming industrious and self-supporting. The two tribes now number about 1,000, separate bands living in Iowa, Nebraska, Kansas and Oklahoma.

Sadi (*sä'dē*), the assumed name of Sheikh Muslih Ad-din, one of the most celebrated of Persian poets, who was born at Shiraz about 1184. Little is known of his life. His father's name was Abdallah, and he was a descendant of Ali, Mohammed's son-in-law. He studied science and theology at Bagdad. He traveled for many years in parts of Asia, Africa and Europe The catalogue of his works contains 22 different kinds of writing in prose and poetry, in Arabic and Persian. The greater part are odes and dirges. The finest of his works is *Gulistan* or The Flower-Garden — a kind of moral work in prose and verse, made up of eight chapters on such subjects as kings, old age and education, with stories, puns and maxims. Two others of his works are *Bustan* or The Tree-garden and *Pand-Namah* or The Book of Instructions. See Robinson's *Persian Poetry for English Readers* and Sir Edwin Arnold's *With Sadi in the Garden.*

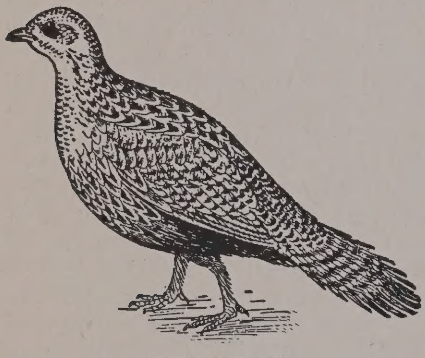
Sadowa (*sä-dō'vä*), a Bohemian village 58 miles northeast of Prague, where an important victory was gained by 240,000 Prussians under King William I over 220,000 Austrians under General Benedik, July 3, 1866. The battle lasted from 8 A. M to 4 P. M., and resulted in the rout of the Austrians, who lost 21,000 men and 22,000 prisoners. The Prussian loss was 9,000 men. This battle, which is often called Königgratz from a town eight miles distant, decided the Austro-German or Seven Weeks' War of 1866.

Safe'ty-Lamp. When marsh-gas, which is often set free in large quantities from coal-seams, is mixed with ten times its volume of air, it becomes highly explosive. Moreover, this gas, the fire-damp of mines, in exploding, renders ten times its bulk of air unfit for breathing, and the choke-damp thus produced is often as fatal to miners as the first explosion. To do away with these dangers, Sir Humphry Davy began his experiments on flame, which resulted in his invention of the safety-lamp. He found that when two vessels filled with a gaseous explosive mixture are joined by a narrow tube and the contents of one fired, the flame does not reach the other, provided the thickness of the tube, its length and the conducting power for heat of its material bear certain proportions to each other; the flame being put out by cooling and its transmission made impossible. He found also that high conducting power and less thickness make up for less length; and to such an extent may this shortening of length be carried that metallic gauze, which may be looked upon as a series of very short, square tubes arranged side by side, wholly stops the passage of flame in explosive mixtures. His lamp consists of a burner inclosed in a wire-gauze. When such a lighted lamp is brought into an explosive mixture of air and fire-damp, the flame is seen slowly to enlarge as the amount of fire-damp increases, until it fills the entire gauze-cylinder. Whenever this pale, enlarged flame is seen, the miners should at once get to a place of safety; for although no explosion can take place while the gauze is sound, yet at that high temperature the metal becomes rapidly burnt and might easily break, and a single opening, if large enough, would then cause a destructive explosion. Many improvements have since been made in Davy's lamp.

Safe'ty-Valve, an appliance for obviating or diminishing the risk of explosion or collapse in steam-boilers, by allowing steam to escape or air to enter. The forms of safety-valves are various but the principle of all is the same, — that of opposing the pressure within the boiler by such a force as will permit the escape of steam before the pressure reaches a point of danger. The airtight valve is usually kept in its place by weights above on a lever or by a spring. United States regulation requires that lever safety-valves shall have an area of not less than one square inch to every two square feet of grate-surface in the boiler. This insures not overweighting the valve. The simplest form is a weight on a steamtight plate fitted over an aperture in the boiler.

Saf′fron is got from the dried flowers of the saffron crocus. It is used as a coloring matter for some articles of food and medicines. It was formerly used for dyeing cloth yellow. Saffron was of much greater importance centuries ago than it is now. The early Greeks used it as a dye, and both they and the Romans as a perfume. As late as the 15th century persons were burned alive in Nuremberg for adulterating saffron. The plant is raised in Persia, Afghanistan, Kashmir, southern Europe and England.

Sage, a general name for a species of *Salvia*, a genus of the mint family, containing about 500 species and distributed throughout the temperate and tropical regions. Over 30 species are found in North America. The common garden-sage is *S. officinalis* from southern Europe. The showy, red-flowered species, which are common in gardens and parks, are derived from several species, prominent among which are *S. splendens* of Brazil and *S. fulgens* of Mexico.


SAGE-COCK

Sage-Cock, Sage-Grouse or **Cock of the Plains,** the largest grouse found in North America. After the turkey it is the largest game-bird in the United States. It lives on the western plains in the Rocky-Mountain region and feeds on wild sage, from which circumstance its name is derived. It feeds also on grasshoppers, crickets, berries, grain and grass-seeds. A full-grown male reaches a weight of six pounds. The upper parts are brown, varied with gray, black and buff, and the under parts mostly black. The bird has a long pointed tail composed of 20 stiff feathers. It also has large air-sacs of yellow skin on each side of the neck. These are inflated in the spring and enable it to produce a deep hollow tone, a booming sound resembling that made by blowing into a large, hollow reed. The nest is made on the ground, concealed under low bush or herbage, is built of small twigs and dried grasses. The eggs generally number from 13 to 17, are brown in color and blotched at one end. In winter the birds dwell together in large flocks; in summer and autumn they are found in smaller companies. The flesh is eaten, but often has a bitter taste.

Sage, Russell, American capitalist and financier, was born in Oneida County, N. Y., Aug. 4, 1816; was brought up on a farm; and received his education at the public schools. In early life he engaged in mercantile pursuits at Troy, N. Y., and was elected to Congress as a Whig in 1853, serving for four years. In 1863 he removed to New York City, where he became interested in railways, especially in the New York elevated-railroad system, as also in various telegraph and cable companies. Becoming a large operator in railway and other stocks, and from buying and selling "privileges" in Wall Street, he amassed great wealth and became director in numberless New York corporations. He died on July 22, 1906, leaving his estate to his wife, who has administered it with wise beneficence in the interests of philanthropy.

Saghalien′ or **Sakhalin** (*sȧ kȧ-lyĕn′*) is a long but somewhat narrow island off the Siberian coast, to the north of Japan. The island has an area of some 29,000 square miles. The interior is mountainous, unfitted for cultivation and covered with pines and firs. The mountains rise in three parallel ranges, and reach a height of about 5,000 feet. The principal industries are fishing, hunting, lumbering and coalmining. At one time Saghalien belonged to the Chinese Empire; but its southern portion was occupied by the Japanese early in the nineteenth century and bartered to Russia in 1875 in exchange for some small islands of the Kurile group south of Japan. The longest river, the Tym, has a course of about 150 miles Alexandrovsk is the chief town of Saghalien. The total population is about 40,000. By treaty at the close of the Russo-Japanese War in 1905 the southern half of the island was ceded to Japan.

Saginaw (*săg′ĭ-na*), **Mich.,** its third city, stands on both sides of Saginaw River, 108 miles northwest of Detroit. The city is the headquarters of the Saginaw Bay lumber and salt trade, and its flour-mills, furniture and other factories stretch three miles along the river. In recent years the mining of soft coal and manufacture of beet-sugar have become leading industries It is a busy, growing place, and it was formerly divided into the cities of Saginaw and East Saginaw. Saginaw was founded in 1822. Population, 74,000.

Saginaw Bay, an arm of Lake Huron and the largest inlet of the southern peninsula of Michigan, is 60 miles long and 30 wide. Saginaw River, 30 miles long, falls into it. It has several good harbors, and under its islands and shores vessels find shelter from the fierce storms that sweep over Lake Huron.

Sa'go, a starch obtained from the stems of certain palms. See PALM.

Saguenay (*săg'e-nā'*), a large river of Canada, falling into the St. Lawrence, about 115 miles below Quebec. It drains Lake St. John, and is about 100 miles long. In its lower course it flows between cliffs, often from 500 to 1,500 feet high, and in many places is two or three miles broad. Its scenery is beautiful, and it is navigable for the largest steamers to Ha Ha Bay. At its mouth is the watering-place and former fur-post of Tadousac.

Sagun'tum, a wealthy and warlike town of early Spain, stood where the modern town of Murviedro is now, near the mouth of Pallantias River. It was a Greek trading-town of prominence, but is kept in memory because of its siege and destruction by the Carthaginians under Hannibal in 219 B. C. Having held out the greater part of a year against the great captain and his army of 150,000, the half-starved Saguntines preferred death to unavoidable surrender. Heaping their valuables into one huge pile and placing their women and children around it, the men made a last sally and the women fired the pile, casting themselves upon it with their children, thus expiring in the flames at the same time that their husbands were dying in battle. The capture of Saguntum initiated the second Punic war. See CARTHAGE, HANNIBAL and ROMAN EMPIRE.

Sahara (*sȧ-hä'rȧ*), the vast desert region of North Africa, stretching from the Atlantic to the Nile and from Morocco, Algeria, Tunis and Tripoli south to the Sudan, is estimated to have a total area of 3,459,500 square miles. Europe could almost be put into this space. It is a link in the chain of great deserts which girdle the Old World from the Atlantic across Africa, Arabia, Persia, Turkestan and Mongolia to the Pacific. The old idea that the Sahara was a vast expanse of sand and once the bed of an inland sea is hardly true. The surface is mostly above the sea, and in one place reaches a height of 8,000 feet. Of large tracts next to nothing is known. On the northern side of this desert is a vast bow of sand-hills; the middle portion is a high tableland with snow-clad mountain peaks; and in the east and west are mountain ranges. Water can almost always be found in the hollows between the sand-dunes and also a little below the surface in the deep valleys between the western mountains, these valleys being mostly dry beds of old rivers. In many parts of the Sahara are oases, islands of green in the midst of an ocean of desert. These oases are most plentiful on the southern side of the Atlas and Algerian mountains, on the northern side of the large central tableland and along certain lines across the desert, which mark the caravan routes between the Sudanese states and the Mediterranean. The principal routes lead from Timbuktu to Morocco and Algeria; from Haussaland and Bornu in Nigeria to Tripoli; from Wadai to Barca; and from Darfur to Siut in Egypt.

A large part of the Sahara, though not the whole, undoubtedly was under water once. The greater part of the surface seems to have been raised, and a process of drying up, similar to that which is now going on in the Turkestan desert, has gone on here from the earliest historic times. The sand is the Saharan rocks ground to dust. The great heat by day causes the rocks to expand; the great fall of the temperature by night, with the great evaporation which then takes place, makes them split and crack and break in pieces; and the strong, fierce winds use these picees like files or sand-blasts to grind other rocks to fragments. These sand-storms are more feared by the traveler than lack of water. Thick deposits of sand have been found on the floor of the Atlantic, a long way west of the African coast. The thermometer falls from above 100° F. during the day to just below freezing-point at night.

On the oases grow date-palms, oranges, peaches and other fruits, rice, millet etc. The oases are the chief centers of population. In the desert little grows except thorny shrubs and coarse grasses. The giraffe, antelope, wild cattle, the wild ass, jackal, ostrich, crow, viper, python, locusts and flies are found. The camel is the great carrier. The people, numbering 2,000,000, are Moors, Berbers, Negroes, Arabs and Jews. The chief products are dates and salt. But a large trade is carried on by caravans, bringing to the Mediterranean ivory, ostrich feathers, gums, hides, gold-dust etc. To get this trade the French are building a railroad from Algiers, which is to extend across the Sahara to the Niger. Another road is projected from Tripoli to the Sudan. Many thousand tons of phosphate are extracted. Different plans for flooding the Sahara and so making it an inland sea have been proposed, but have been dropped since it became known that the greater part is above sea-level. However, the French since 1856 have dug many artesian wells, striking water in abundance at depths of 10 to 300 feet. Wherever these wells have been bored, date-palm groves and orchards have increased in size and the population has become greater.

The Sahara, to the extent of a million and a half square miles, has been recognized by Great Britain as under the protectorate of France, taking in the entire desert from the Nile basin to the undefined Spanish boundary on the west. It has not yet been brought under French administrative schemes. See Barth's *Travels in North and Central Africa.*

Saigon (*sĭ-gōn*), capital of French Cochin-China, stands on Saigon River, 60 miles from the sea. The present town has grown up since 1861, and is one of the handsomest cities in the east. The governor's palace, cathedral and arsenal are among its fine buildings. Chinese, Anamese and French make up the bulk of the population of 50,870, the suburb of Cholon, really a part of the city, having 130,000 inhabitants. Saigon is the chief port between Singapore and Hong-Kong There is a railroad from Saigon to Mytho. The main export is rice. See COCHIN-CHINA.

Sail. Sails are generally made of flax and hemp, but jute, cotton and linen are also used, while savages make them of matting and vegetable fibers. Sails are stretched by means of masts, yards, booms, gaffs and ropes. A vessel of shallow draught or of narrow beam can bear little sail, while a vessel of deep draught and heavily ballasted, as a yacht, or a vessel of great breadth of beam can carry large sail. A sail acts with greatest power when the wind is right astern, but it can be applied with less strength when on either beam. In the latter case the force of the wind is divided into two parts, one part tending to make the ship go forward, the other tending to make it go sideways, but from the shape of the vessel this second force causes little motion; any that it does cause is called leeway. The sails which are set square across the ship are nearly square in shape, and are called square sails. But many which are set parallel with the keel, called fore-and-aft sails, are also four-sided. Others are three-sided, as stay-sails, which are suspended from the ropes which stay the masts. The larger sailing-vessels usually carry both fore-and-aft and square sails. The schooner has mainly fore-and-aft sails. The brig is mainly square-rigged, and the brigantine is a cross between the brig and the schooner. The cutter is a fore-and-aft one-master. The ordinary sails are mentioned under YACHT.

St. Albans (*al'banz*), a town of Hertfordshire, England, famous for its Benedictine abbey, which was founded by Offa, king of Mercia, in 793. Cardinal Wolsey was its greatest abbot. It contains the tomb of Sir John Mandeville, the early traveler. In St. Michael's church is Lord Bacon's monument. Here were fought two battles during the War of the Roses. Population 16,109.

St. An'drews, a Scottish town, stands on St. Andrew's Bay, 42 miles northeast of Edinburgh. St. Rule's tower; the bishop's castle, noted for its battle-dungeon and within whose walls Cardinal Beaton was slain; and the cathedral consecrated in the presence of Robert Bruce are among the interesting buildings. The schools of St. Andrews were well-known in 1120, but the university, the first in Scotland, was not founded till 1411. It is one of the smaller British universities, but is doing much for the higher education of women. The library has over 100,000 volumes, and there is a good museum. Population 7,621.

St. Augustine (*a'gŭs-tēn*), **Fla.,** an old Spanish town on the eastern coast, stands on Matanzas Sound, two miles from the Atlantic and 37 southeast of Jacksonville. It was founded by Menendez, who built a fort here in 1565, and is the oldest town in the United States. It was several times attacked by the French, English and Indians. A sea-wall, a mile long, affords a fine promenade. The postoffice once was the residence of the Spanish governor, and the large barracks occupy an old Franciscan monastery. The old fortress of San Marco, now Fort Marion, was built by Indian slaves, who worked on it for more than a century. Besides its quaint Spanish lanes and balconied buildings, crumbling gates and magnolias, palms and oleanders, it has the most costly and magnificent hotels in the world. Two of these, the Ponce de Leon and the Alcazar, are massively built of shell-concrete, with towers, casinos and courtyards; a third is Hotel Cordova. Attractive drives, yachting and, above all, the climate bring thousands of northern visitors. Population, 7,200.

St. Ber'nard Dog. See DOG.

St. Bernard (*sȧnt bẽr'nȧrd*). the name of two passes in the Alps. Great St. Bernard is 8,120 feet high Almost on its crest stands the celebrated hospice founded in 962 by Bernard de Menthon, a neighboring nobleman, for the benefit of pilgrims journeying to Rome. It is the loftiest inhabited place in Europe. Now a telephone tells the monks when travelers are on their way up the mountain. These dozen monks, all young and strong, with the aid of large dogs — no longer the famous St. Bernard dogs, but Newfoundlands — rescue travelers who are in danger of perishing from the snow and cold. There is a botanical garden for Alpine plants on the northern slope of the pass. It was over this pass that Napoleon marched his army. Little St. Bernard is the pass used by Hannibal when he led his troops into Italy. It also has a hospice, 7,143 feet high.

St. Cath'erines, Can., on Welland Canal which connects Lake Erie and Lake Ontario. It is on the main line of the Grand Trunk Railway from Toronto to Niagara Falls. It takes water-power from the canal and has many and varied important industries. It is the center of a very rich fruit-country. It has railway communication from Port Dalhousie on Lake Ontario, which is only six miles distant. Comfortable passenger-boats cross the lake a distance of 34 miles to Toronto. It has electric railway communication with Buffalo.

Saint Charles, Mo. County-seat of Saint Charles County, located on the Missouri River, twenty miles from Saint Louis, with which it is connected by railroads and electric lines. It is the center of a rich agricultural section and has one of the most extensive car-factories in the United States. Other manufactures are shoes, oil engines, flour, furniture, brick, cob-pipes and beer; corn, wheat, tobacco and limestones are marketed there. It is the seat of Lindenwood Female College, Saint Charles Military College and The Sacred Heart Academy. Population, 10,056.

St. Clair', a river of North America, in the line of the Great Lakes, carrying the waters of Lake Huron into Lake St. Clair at the rate of 225,000 cubic feet a second. It is over 40 miles long and half a mile broad. In 1891 a railroad tunnel under its bed was finished between Port Huron, Mich., and Sarnia, Ont., including approaches 11,553 feet long.

Lake St. Clair is 26 miles long and 25 wide. From its southwestern end the volume of water it has received passes into Lake Erie by means of Detroit River.

St. Cloud (*săn'-klōō*), a French town near the Seine, ten miles west of Paris. St. Cloud was long famous for its fine castle, built by the Duke of Orleans, the brother of Louis XIV. It afterwards was a favorite palace of Napoleon. It was destroyed during the siege of Paris in 1870. Population 7,195.

St. Cloud', Minn., city and county-seat of Stearns County, on the Mississippi River, about 65 miles northwest from Minneapolis. In the vicinity are extensive granite-quarries, and the surrounding country is agricultural. The chief manufacturing establishments are flour-mills, woodworking factories, machine-shops and foundries; there also are grain-elevators and stock-yards. St. Cloud has good public and parochial schools, a state normal school and Saint Clotilde Academy of Music. Here, too, are Minnesota Reformatory, Saint Raphael Hospital and Saint Joseph Home for the Aged. The settlement was established in 1852, incorporated in 1856, and became a city in 1868. It has the service of the Northern Pacific and Great Northern railways. Population, 19,000.

St. Croix (*kroi*), called also the Passamaquoddy and the Schoodic, a river flowing out of Grand Lake on the eastern border of Maine, runs southeast 75 miles to Passamaquoddy Bay. It forms part of the boundary between the United States and New Brunswick. It is navigable to St. Stephen, twenty miles from its mouth.

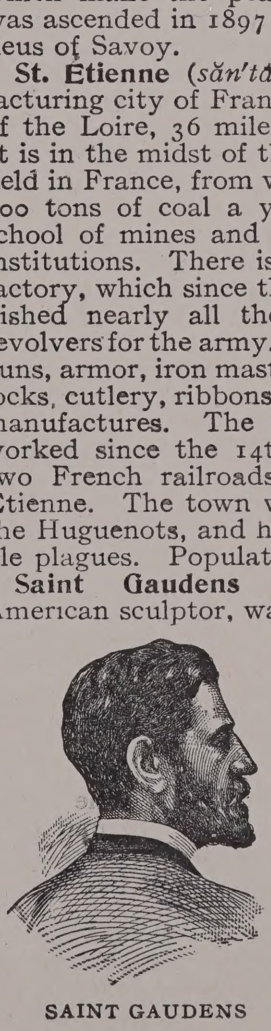
St. Cyr (*săn'sẽr'*), a French town two miles west of Versailles. A school for poor girls was founded here by Louis XIV and for its pupils Racine wrote his tragedies of *Esther* and *Athalie*. In 1806 Napoleon founded in its place the military school of St. Cyr, one of the most famous in the world. Population 4.250.

St. Denis (*săn de-nē̆'*), a noted French city, is four miles north of Paris, within the line of forts forming the outer defenses of the capital, and was itself formerly fortified. A famous fair has been held here since 1552. The Abbey of St. Denis was the burying-place of the kings of France. The finest of the tombs are those of Louis XII and Anne of Brittany, his queen, Francis I, Henry II and Catherine de Medici. Napoleon turned the abbey into a school for the daughters of offices of the Legion of Honor. During the French Revolution the tombs were demolished and the bodies cast into ditches. Population 60,808.

St. Eli'as, Mount, a great volcanic mountain in Alaska, near the Canadian boundary line. It was long thought to be the highest mountain on the American continent, but is now known to be surpassed by Mt. Logan, 26 miles northeast of St. Elias and by Mt. McKinley in Alaska. Its height as determined by the United States geodetic survey is 18,100 feet. It is covered almost from base to top with never-melting snow. There are huge glaciers, precipices and chasms, which make the peak hard to climb. It was ascended in 1897 by Prince Louis Amadeus of Savoy.

St. Étienne (*săn'tā̆'tyĕn'*), a large manufacturing city of France, stands on a branch of the Loire, 36 miles southwest of Lyons. It is in the midst of the second-largest coal-field in France, from which are taken 3,000,000 tons of coal a year. The art-gallery, school of mines and museum are the chief institutions. There is a large national gun-factory, which since the Revolution has furnished nearly all the muskets, rifles and revolvers for the army. Steel and iron plates, guns, armor, iron masts, machinery-castings, locks, cutlery, ribbons and laces are the chief manufactures. The coal-mines have been worked since the 14th century. The first two French railroads were built from St. Etienne. The town was captured twice by the Huguenots, and has suffered three terrible plagues. Population 148,566.

Saint Gaudens (*gạ'denz*), **Augustus,** American sculptor, was born at Dublin, Ireland, March 1, 1848, and came in his infancy to New York. Here he learned the trade of a cameo-cutter, and studied drawing at Cooper Institute and later at the National Academy of Design. From 1867 to 1872 he pursued his artistic studies at the *Ecole des Beaux Arts*, at Paris, and



SAINT GAUDENS

at Rome, where he produced *Hiawatha*, his first sculptured figure. Returning to New York, he opened a studio and produced a number of busts, statues and emblematic subjects. The more prominent of these are his statues of Abraham Lincoln, Admiral Farragut, William M. Evarts, Gen. W. T. Sherman, John A. Logan, Peter Cooper, Robert R. Randall, Theodore D. Woolsey, and other memorial sculptures, portrait-busts, bas-reliefs, tablets etc. Notable, also, are his figure pieces — *The Puritan*, *Diana* (on the tower of Madison Square Garden in New York City) and the fine bas-relief in St. Thomas Church, New York City, entitled *Adoration of the Cross by Angels*, unhappily destroyed by fire in 1905. Effective also is his *Shaw Memorial* tablet in Boston Common. He was the recipient of many medals and honors; while France made him an officer of the Legion of Honor and corresponding member of the Institute of France. He died at Cornish, N. H., Aug. 3, 1907.

St. Germain= (*zhâr′măn′*) **=en=Laye,** a famous French city on the Seine, 13 miles east of Paris. A fine terrace, built in 1672, runs along the river in front, and behind the city is a royal forest of 10,000 acres The royal castle was the favorite residence of the kings of France until Louis XIV moved the court to Versailles. Population 17,297.

St. Gotthard (*sânt′gŏth′ärd*), a mountain in the Alps, 9,850 feet high. Here are the sources of the Rhine, Rhône, Ticino and Reuss, whereby St. Gotthard sends its melted snows to the German Ocean, the Mediterranean and the Adriatic. Across its shoulder runs one of the famous passes from Switzerland to Italy, 6,936 feet high. Near the top stand two hotels and a hospice for the 12,000 travelers who use the pass every year. Now most of the traffic goes through the tunnel, finished in 1880, which is 9¼ miles long and cost $11,350,000, while the whole cost of the St. Gotthard railroad was $45,400,000.

St. Helena (*hĕ-lē′nȧ*), a lonely island in the Atlantic, 1,200 miles from the western coast of Africa, covering 47 square miles. It is a part of an old volcano; and High Hill is 2,823 feet above the sea. Its shores are cliffs from 600 to 2,000 feet high, cut by deep, narrow valleys. The people, who number only 3,512, raise potatoes, and fish for whales. Jamestown is the sole town. The Suez Canal destroyed a large trade with vessels which stopped on the way to and from India by the Cape of Good Hope. The chief trade now is the export of the produce of the whale-fisheries to the United States. There are cable-communications with Cape Town and with Sao Vicente in the Cape Verd Islands. The island is a British coaling-station, and the naval squadron of the Cape and West Africa rendezvous there frequently. St. Helena was discovered by the Portuguese in 1502, and taken possession of by the British East India company in 1651. The island is chiefly noted as the place of Napoleon's imprisonment from 1815 to his death in 1821. His home was the farmhouse of Longwood, three miles inland from Jamestown. Many Boer prisoners were sent here during the war in South Africa. See Melliss' *St. Helena*.

St. Hen′ri, Can., suburb of Montreal and also in Hochelaga County, has 21,192 inhabitants. It is two miles from the metropolis, Ste. Cunégonde lying between.

Saint=Hilaire (*săn tē′lêr′*), **Geoffroy Etienne,** a French naturalist, noted for his work in comparative anatomy and for his connection with the theory of evolution. He was born at Étampes, April 15, 1772, and died at Paris in 1844. He became attached to the Museum of Natural History at the *Jardin des Plantes*. Here he was associated with Cuvier and Lamarck. He became professor of zoology, and devoted himself mainly to the study of vertebrates. He published works on the structure of animals and on the philosophy of anatomy. In 1803 he was given the badge of the Legion of Honor, and in 1807 was elected to the Institute. He reached the conclusion that there is a unity of plan in the construction of all animals, and he accounted for the origin of different animals through the changes produced in them by the surrounding conditions. As an evolutionist he sided with Lamarck against Cuvier, who believed in the fixity of species. (See EVOLUTION.) He, however, was more nearly a follower of Buffon than of Lamarck. In 1830, just after the death of Lamarck, he engaged in a controversy with Cuvier before the Institute on the unity of type and the evolution of animal life. This debate was so famous that it stirred all intellectual Europe Cuvier won by his great authority and the more skillful management of his side of the case. He was partly right, but as regards the evolution of animal life later evidence is against him.

St. Hyacinthe (*hī′ȧ sĭnth*), **Can.,** county-seat of the county of that name, lies on the west bank of Yamaska River, 35½ miles from Montreal on the Grand Trunk Railway. It has 9,210 inhabitants, and is the seat of a Roman Catholic cathedral and a large Dominican college. Much manufacturing is done, chiefly shoes, woolen-goods and milling-machinery.

St. James' Palace, a large brick building, fronting toward Pall Mall, London. At first a hospital, it was made a royal manor by Henry VIII. Here Queen Mary died, and Charles I slept here the night before his execution. When Whitehall was burned in 1697, St. James became the regular London palace of the English sovereigns and so continued until Queen Victoria removed the royal household to Buckingham Palace in 1837. The Court of St. James is a name often given to the British court.

St. John, City of, Can., is the great seaport of New Brunswick. Its harbor is open all year and with Halifax disputes the position of the first winter-port of Canada. This excellent harbor has large wharves and an elevator. It is the terminus of the Canadian Pacific Railway (*q. v.*), and is tapped by a branch of the Inter-colonial. A branch of the Grand Trunk Pacific (*q. v.*) will reach it. Ocean-liners run to this port particularly in winter, and it has constant steamship-connection with the New England cities and Nova Scotia. One of its attractions is the natural wonder of the reversible falls in St. John River. When the tide is out, the falls flow towards the sea, but, as the tide rises, it gradually obliterates the cataract until there is still water over its side through which vessels may pass, and then it rises until the falls are flowing inward up the river. Population 42,000.

St. John Lake, Can., known to all travelers which measures 26 miles in length by 24 in breadth, and drains an immense valley that bears its name. It also receives several large rivers which drain lands of great fertility. The chief rivers to the south are the Metabethchouan and the Ouiatchouan; to the east, La Belle Riviere; to the west, the Ashuapmouchouan; to the northwest the Ticouapee and Mistassini; to the north and northeast, the Great and Little Perihonka The depth of water generally is three feet a mile from the shore, from 12 to 54 feet a couple of miles further out, and about 60 to 80 feet at the center. It is in this fine lake and its numerous tributaries that sportsmen enjoy magnificent fishing for the ouananiche or freshwater salmon. Several steamboats navigate the lake, all starting from Roberval.

St. John of Jerus'alem, Knights of, a celebrated military and religious order of the middle ages, was founded about 1048 in a hospital built by merchants of Amalfi at Jerusalem for the care of pilgrims to the Holy Sepulchre. After the conquest of Jerusalem by the crusaders in 1099, the hospital servants were joined by many from the Christian army, who resolved to devote themselves to the service of poor and sick pilgrims. They soon became an order, which was military as well as religious, and the members of the order became known as Hospitallers. Saladin forced them in 1191 to retire to Acre, the last Christian stronghold in Palestine, which they held with great bravery for a century, but then after a terrible siege were compelled to sail to Cyprus. In 1310 the knights captured Rhodes and seven neighboring islands from the Greek and Moslem pirates, and for over 200 years waged successful war against the Turks. In 1523 Sultan Solyman captured Rhodes, and after a short stay at Crete Charles V gave Malta, with Tripoli and Gozo, to the Hospitallers. In 1565 Dragut, the corsair, after capturing Tripoli, laid siege to Malta, but was beaten off. By 1798 the order was of little importance, and Malta was surrendered to the French. Certain branches are still kept up in Europe.

St. John, a river rising in Maine and flowing into the Bay of Fundy. It is navigable for small craft for 155 miles to Woodstock. Through most of its upper course it forms the boundary line between Maine and Canada.

St. John's, capital of Newfoundland, is on the eastern coast, 1,076 miles northeast of Montreal, and is the nearest port in America to Europe, being only 1,730 miles from Cork. It has a good harbor, two railroads and a number of manufactures. Population 29,594.

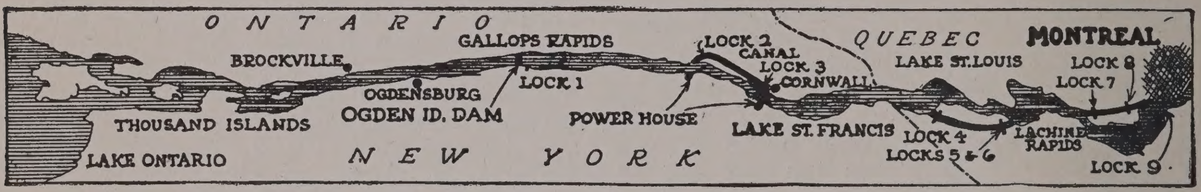
St, Johnsbury, Vt., at the junction of three railroads, is the home of E. & T. Fairbanks & Co., scale manufacturers. Machine shops, granite shops, builders' finishing, grain, grocery, maple sugar, fork and hoe factories are located here. St. Johnsbury has an academy with over 300 scholars, a library, and a museum of natural science. Population, 9,000.

St. Jo'seph, Mo., on the Missouri, is served by eight railroads and several interurbans. The river is crossed by a steel railroad bridge of five spans, one a draw-span of 365 feet. The State Hospital for the Insane, St. Joseph's Hospital, Ensworth Hospital, Noyes Hospital, 3 public libraries and 37 public schools with 375 teachers are located here; also a dozen private schools and colleges. There are 73 jobbing-houses and extensive manufactures of men's working clothes, boots, shoes, harness, saddlery, office-fixtures, confectionery, stationery, millinery and groceries. The stockyards cover more than five hundred acres, and the annual livestock receipt averages 3,200,000 head, which places St. Joseph in a prominent position among the large packing house centers of the west. It is also an important grain market. The output of flour mills, creameries and tanneries is very large. Joseph Robidoux, a French-Indian trader, laid out the town in 1843. It soon became famous as a starting-point for the long journeys in wagons across the plains, and was the eastern terminus for the Pony-Express. Its area is 8,742 acres. Population, 85,000.

Saint-Just (*săn'zhüst'*), **Louis Antoine de,** French revolutionist, was born at Décize, Aug. 25, 1767. While studying law at Rheims he was captivated by Rousseau's writings, and, to become a writer, set off to Paris at 19, taking some of his mother's plate, and was at her request imprisoned for six months. His essay on *The Spirit of the Revolution* gained him some standing, and as a member of the convention he attracted notice by his fierce tirades against the king and by making the opening speech on the verdict at his trial. As a follower of Robespierre he began the attacks on Hébert, which sent him to his doom, quickly followed by the fall of Danton. Saint-Just fell with Robespierre, but unlike him, carried his head high on the tumbrel, and died in silent dignity, on July 28, 1794.

St. Lawrence, Gulf of, an inland of the northern Atlantic Ocean, is bounded by Newfoundland, Quebec, New Brunswick and Nova Scotia. It is joined to the Atlantic by the Strait of Belle Isle between Newfoundland and Labrador; by the Gulf of Canso between Cape Breton and Nova Scotia; and by Cabot Strait, a wider passage than either, between Cape Breton and Newfoundland. The main islands are Anticosti, St. Paul's and Prince Edward. The gulf is noted for its very productive fisheries. As the land was submerged in comparatively recent times, the passages from the ocean to the St. Lawrence River are deep, Cabot Strait having a depth of 1,200 feet, and the Strait of Belle Isle, 600 feet.

St. Lawrence River, The, one of the most picturesque and interesting rivers in the world, flows from Lake Ontario into the Gulf of St. Lawrence. The waters of the great inland lakes find their outlet through the St. Lawrence, which is 1,900 miles in length. Shortly after leaving Lake Ontario, it expands into the Lake of The Thousand Islands, world-famed for their beauty. Leaving the islands and reaching nearly to Montreal are a series of rapids, the Galops, the Long Sault, the Coteau, the Cedars, the Cascades and Lachine, with stretches of quiet water between. To eastbound passengers they are exciting and interesting. The return trip is made by means of canals built at great cost by the Canadian government, to climb the fall of 240 feet from Lake Ontario to Quebec. The islands contain numerous summer-resorts which are extensively patronized. The river, with the system of canals established on its course above Montreal and with Lakes Ontario, Erie, St. Clair, Huron and Superior and connecting canals, affords water-communication from the Straits of Belle Isle to Port Arthur, at the head of Lake Superior, a distance of 2,200 miles. Its drainage area occupies 565,200 square miles. Since 1888, when a channel depth of twenty-seven and one-half feet was dug from Montreal eastward 108 miles to a point within tidal influence, Montreal has been at the head of ocean navigation coming up the St. Lawrence. Navigation, closed during winter months, is opened about the end of April.



Map Showing Great Lakes—St. Lawrence Waterway Project

St. Lawrence Waterway Treaty. Early in 1934 the St. Lawrence Waterway treaty was dealt a crushing defeat in the Senate by a vote of 46-42. An affirmative vote of two-thirds of those present was necessary for ratification. The rejection by the Senate of the seaway treaty marked the first defeat in major legislative matter which President Roosevelt had met with in the seemingly docile and amenable Seventy-Third Congress.

The treaty was drafted during the Hoover Administration. It was signed on July 18, 1932, at Washington. It was not binding to either Canada or the United States, however, until it had been ratified by the United States Senate, the Canadian Parliament, and the English Privy Council. The treaty was brought before the Seventy-Third Congress of the United States which convened in Washington in January.

The project of the waterway through the Great Lakes and St. Lawrence River to the Atlantic with a minimum depth of twenty-seven feet, has been under consideration for several years. Engineers and statesmen from both the United States and Canada have discussed the possibilities and advisability of pursuing such a project.

The opposition of Chicago and the Mississippi Valley to the waterway was undoubtedly of major importance in determining the defeat or victory of the treaty in the Senate. On January 10, President Roosevelt sent his message to the Senate asking for ratification of the treaty. Since that date strenuous debating has been in progress in the Senate. On March 24, twenty-two Democratic Senators joined with twenty Republicans to vote against the ratification of the treaty, thus defeating a project which President Roosevelt was so desirous of having developed.

St. Louis (*sânt lo͞o′ĭs* or *sânt lo͞o′ĭ*), the foremost city of the Mississippi Valley and the largest city between the Great Lakes and the Gulf Coast, is situated in Gratiot County, Missouri, on the Mississippi River at the point where the waters of the Missouri enter it, 200 miles north of the Ohio River, and 280 miles southwest of Chicago. It is strategically located in the center of the Mississippi Basin, about midway of the center of population and the geographic center of the United States. The city possesses a river frontage of nineteen miles, and occupies an area of more than sixty-one square miles.

Description. St. Louis is situated on the bluffs of the Mississippi River, which were cut away and graded to make room for the business section. The entire city rests on a limestone foundation. Its extension into Illinois, known as East St. Louis, is on the bottom lands, and protected against inundation by an extensive system of levees. Only a small section of the city at the waterfront is imperilled at the highest stage of floods. The ground rises gradually from the river to the high plateau of the Missouri and the Meramec. St. Louis has sixty-five parks, covering about 3,000 acres. Forest Park comprises 1,400 acres and is one of the largest municipal parks in America. The zoo in Forest Park is world famous. Within this park is the City Art Museum, which has one of the finest collections of American paintings, beautiful Chinese and Japanese art, and Greek vases. It also contains a parade ground, forty-five tennis courts, twenty-two baseball diamonds, three golf links, and soccer fields. Tower Grove Park is beautifully landscaped. Fairground Park extends over an area of 129 acres and is the former site of the annual St. Louis Fair. The Missouri Botanical Garden, comprising fifty acres, is under control of a private board, but in effect is a part of the public park system. There are many important works of sculpture in the city. In Tower Grove Park are bronze statues in heroic style of Shakespeare, Columbus and Humboldt. In Forest Park are the equestrian statue of General Franz Siegel and that of Saint Louis, crusading king of France, for whom the city was named. A reproduction of the Hondon statue of Washington in the Virginia State House, stands in Lafayette Park. There is a bronze statue of Jefferson in the center of the Jefferson Memorial. Near the Kingshighway entrance to Forest Park is the beautiful Romanelli Fountain. Just beyond the city to the south the Ozark Up-lift begins, the doorway to an ideal vacation land. The Mississippi is turbid and yellow in springtime, especially, but its waters are taken through the largest rapid sand filtration plant in America, and emerge clear and sparkling for city use.

Transportation. St. Louis is provided with remarkable transportation by river, railway and highway. The river bank is paved with cobblestones and lined with floating wharves. Across its waters stretches the Great Eads bridge, one of the most remarkable railroad bridges in the world, 1,524 feet long, which leads into a railroad tunnel extending 4,000 feet under the business section of the city. A few miles above is the Merchants' Bridge of steel, 2,450 feet in length. The Municipal Bridge is the most recent, and one of the greatest engineering feats in the United States. Twenty trunk line railroads, most of which use one of these two bridges, enter the city, which has the most comprehensive consolidated terminal operations of any city in the United States. All of the passenger trains enter the Union Station, one of the largest, best arranged in the world. Trains back into the mammoth shed on thirty-two parallel tracks, and mail and express are lowered by elevators to subterranean levels. The railroads which use this station are stockholders in the company that owns it, and operation costs are paid on a basis proportional to the number of cars entering and leaving the station for each railroad. The freight is handled similarly at the Cupples Station named for one of the two merchants who designed it and gave the entire site to Washington University. The heaviest shippers rent quarters along a system of platforms provided with elevators, trucks and switches, all under local management. An exact time schedule has been arranged and the Cupples Station employés are responsible for all details of loading and unloading. The system saves much time and expense.

St. Louis has access to 13,394 miles of navigable inland waterways. It is connected by water with twenty-nine of the chief industrial cities of twenty states in the Mississippi Valley. Six huge airports connect it with the important trade centers of the country. Electric lines, street cars, motor buses and great highways form a network through the city and stretch out into both Missouri and Illinois.

Buildings. The Union Station is one of the largest railway stations in the world, and occupies more than eleven surface acres of the city. As it is one of the most remarkable of the buildings of St. Louis, so is the Court House one of the finest. It is shaped in the form of a Greek cross and rises in a dome almost 200 feet high. Moreover, its historical importance is unique in that one of the most important slave markets in the country was formerly held on its steps. The municipal group which includes the City Hall, Municipal Courts Building, the Children's Building and the City Hospital, is impressive. Other notable structures include the Exchange buildings for merchants, railway, cotton and fur. The Coliseum is a huge building used constantly for trade and agricultural exhibits. The Louisiana Purchase is commemorated in the Jefferson Memorial. Among the outstanding hotel buildings, are the Planters, the Southern, the Lindell, the Jefferson and the Statler. The St. Louis Club, one of the richest in the city, is housed on Lindell Boulevard. The Public Library has a central building of attractive design, with a reading room ceiling copied from the Laurentian library in Florence, Italy, designed by Michael Angelo. Among the outstanding buildings are many connected with the St. Louis educational system, which is one of the best in the country and housed in solidly constructed but beautiful buildings. Higher education is represented by Washington University and St. Louis University. Special schools include the famous Lindenwood, Lenox Hall, Hosmer Hall, John Burroughs School, and four large flying schools. A number of the charitable institutions have buildings of outstanding architectural design. Among the beautiful churches of the city are the former

Roman Catholic Cathedral; the Cathedral of St. Louis, which is one of the largest church buildings in the United States; the Rock Church; Christ Church; the Church of the Messiah, and the Shaare Emith Synagogue.

Industry. St. Louis is the fifth grain market of the United States, the second hog market, and the largest horse and mule market in the entire world. In 1929, there were received in the city 75,000,000 bushels of grain. The livestock receipts of 1928 were 70,094 horses and mules; 1,140,043 cattle; 548,317 calves; 6,203,278 hogs, and 629,274 sheep. The National Dairy Show is held annually in St. Louis in a great arena, the largest indoor arena in the United States except Madison Square Garden. St. Louis became the world's greatest fur market when selected for the sale of Government furs. It is the largest shoe manufacturing and distributing center in the United States; the greatest manufacturing and jobbing center for stoves and ranges in the world; the largest wholesale market for hardware, and the largest manufacturer of tobacco products in the world.

An unlimited supply of coal, remarkable transportation plants, ideal situation for a wholesale distributing center, fresh water, and natural gas all further the industries of St. Louis. Chief among these are steel furnaces, stoves and ranges, sugar mill machinery, woodenware, street cars, terra cotta, feed, drugs, chemicals, automobiles, brick, barbers' supplies, shoes, hardware, furs, coffins, lumber, millinery, iron and steel products, railroad cars, airplanes and parts, motors, electrical equipment and accessories, glass bottles, white lead, belts, nuts and piston rings. Since St. Louis is a port of entry, the imports afford a considerable trade.

Population. The population of St. Louis in 1930 was 821,960, with a metropolitan area population of 1,293,516. Of the population of St. Louis proper, 646,493 were native whites, 80,386 foreign born whites, and 93,580 Negroes. Chief among the foreign born whites were Germans, of whom there were 22,315; 9,914 Russians, and 9,489 Italians.

Government. The city is governed by the Mayor and a Board of Aldermen consisting of twenty-nine members, who serve for four-year terms. The Mayor, Comptroller, President and members of the Board of Aldermen, Treasurer, Assessor, Register of Deeds and State Collector are elected. The remainder of the municipal officials are appointed by the Mayor. City employés are appointed according to a merit system which functions through a system of competitive examinations, in charge of an Efficiency Board of three members. The charter provides for the initiative, referendum and recall.

History. Auguste Chouteau from New Orleans founded a trading station on February 14, 1764, and Pierre Ligueste in the same year laid out a town about the station which he named after Saint Louis or Louis IX of France. Although St. Louis remained a fur trading post until 1803, it was already important. In 1771, as the capital of Upper Louisiana, it came into Spanish possession, but remained French nevertheless. In 1803 Louisiana was formally ceded back to France by Spain, and several months later was bought by the United States as a part of the Louisiana Purchase. In 1808 the first newspaper was founded and in 1809 the town was incorporated. The first steamboat arrived at St. Louis on August 2, 1817, and instantly because of its waterway connections, the town began a rapid development as the most important point in the settlement of the West beyond the Mississippi. John Jacob Astor opened the Western branch of the American Fur Company at St. Louis in 1819. The city was chartered in 1822, and about ten years later began its most marked development. Contributing factors to its rapid growth were the German immigration after the revolution of 1848, the beginnings of railroads in Illinois and the gold rush in 1849. Between 1850 and 1860 the population of St. Louis increased 105 per cent. At the opening of the Civil War, there were 160,000 inhabitants in the city. From St. Louis were directed the Federal operations that resulted in controlling the Tennessee River and the lower Mississippi. In 1869 the Big Mound, located at what is now the corner of Mound Street and Broadway, was cut down, and proved to be one of the most remarkable archæological remains in North America. A destructive cyclone visited the city in 1896. In 1904 the Lousiana Purchase Exposition was held, and the centennial of the incorporation of St. Louis was celebrated in 1909.

Saint-Louis, the capital of the French colony of Senegal in West Africa, is situated on a small island near the mouth of the Senegal River. Bridges join it to suburbs on either bank. St. Louis is one of the loveliest towns in West Africa. It is carefully planned, and has a cathedral, the governor's palace, and a number of public buildings. A sandbar makes the river-mouth dangerous to vessels, and freight is landed at Dakar on Cape Verde, 100 miles southwest, and brought to St. Louis by rail. It has a trade of $5,000,000 a year, its chief exports being gums and earth-nuts. The climate is unhealthful. Water is brought to the town by an aqueduct seven and one-half miles long. It was founded in 1626, and in 1931 had a population of 29,608, of whom 901 were Europeans.

See French West Africa; Senegal.

St. Mark's Cathedral, one of the most beautiful and famous cathedrals in the world, is situated in Venice. It dates from the ninth century, although until 1807 it was officially only the chapel of the Doge's palace. It grew in splendor, however, with the growth of the power and pomp of Venice. It was begun in Romanesque style, and reconstructed in Byzantine, with numerous later Gothic additions. St. Mark's is in form of a Greek cross, 250 feet long and 170 feet wide, with Byzantine domes surmounting each of the four arms and the center. Its oriental cupolas and spires were gradually erected; and the interior was beautified by mosaics, silver and gilt work and precious stones in the most lavish detail. Over the porch at the center are set the bronze lions of St. Mark, for a time the prey of Napoleon but now once more to be seen in the city which they have beautified for centuries. The church and its chapels contain many fine paintings and rich treasures of art in statuary, plate and books. The great picture of St. Mark above the central doorway has been made from the drawings of Titian.

St. Mary's (*sānt mā′rĭz*), **Strait** or **River** connects Lakes Superior and Huron, and forms the boundary between Ontario and the upper peninsula of Michigan. The strait is sixty-three miles long. One mile below Lake Superior are the rapids called the Sault Ste. Marie, below which the river spreads out into a broad lake. These rapids have a fall of twenty-two feet in the course of a single mile. To overcome this fall, a canal was built in 1855, most of it cut through solid rock. In 1895 a canal was opened on the Canadian side. There is a greater annual tonnage through the locks of these canals than through the Suez Canal. Ice closes the river to navigation during the coldest weather. On the picturesque islands in the river are situated popular summer resorts.

St. Maurice (*sănt mô-rēs′*), **River,** an important tributary of the St. Lawrence, rises in Quebec, and flows from northwest to southeast emptying into the St. Lawrence at Three Rivers, near Lake St. Peter. It rises at the height of land in a group of lakes, is quickly swelled by the rivers along its course, and, when barely a few leagues from its source, has become a majestic river, navigable in stretches of considerable length. Its total length is 325 miles and its average width 800 feet. Its chief tributaries are the Matawin, which carries down a great body of water, the Mekinac, the Bostonnais, the Croche near La Tuque and the Vermillion. The territory drained by the St. Maurice and its tributaries comprises about 16,000 square miles. It affords transportation for an extensive lumber region, being navigable for seventy miles in its longest single stretch.

St. Paul (*sānt pôl′*), the capital of Minnesota, the seat of Ramsey County, is situated in the southeast central part of the State on the Mississippi River. It adjoins the city of Minneapolis having University Avenue as the boundary line between the Twin Cities, as they are popularly called. This avenue also divides Hennepin and Ramsey Counties. St. Paul covers an area of over fifty-five miles which is composed of three quite distinct terraces or plateaus. The first of these extends along the river front, where the railroad yards are located, also the Union Station, factories and wholesale houses. The river bottoms are but 695 feet above sea level, and above this extends a plateau upon which the business district and most of the residential section are situated. St. Anthony Hill is one of the finest districts of beautiful and substantial homes in the country. Summit Avenue is the principal thoroughfare in this residential section and extends along the edge of the bluffs. The Midway District, adjoining Minneapolis stretches east and west from Snelling Avenue to the city limits, and north and south from the city limits to the Mississippi River. In this section is located the Minnesota Transfer, the second largest freight transfer in the world, where all freight cars entering both cities are managed and routed. The highest elevation within the city limits is 1,016 feet.

The city has a very picturesque and extensive park and boulevard system. There are eighty parks, wide and excellent boulevards and public playgrounds extending over an area of 1,800 acres. The finest of these is Como Park which occupies 425 acres and has two connecting lakes. Among the other large parks of the city is Phalen Park, of 465 acres. Indian Mound Park, overlooking the Mississippi has unusually beautiful scenery in its seventy acres. The Mississippi River Boulevard Park extends along one-third of the distance of the river within the city and covers 178 acres. Harriet Island, situated just opposite the business district, is equipped with public baths and outdoor gymnasiums. Along the wooded bluffs of the Mississippi stretches a boulevard connecting the principal streets of the city and on the opposite side there is a similar drive from which an excellent bird's eye view of the capital may be sighted. Fort Snelling, at the mouth of the Minnesota River dates back to the early days of both cities and was a training camp for United States Army officers for the World War. It comprises 2,381 acres. On the north the Fair Grounds of 200 acres adjoin the city. Here stand the buildings of the State Agricultural Society. There are 835 miles of thoroughfare in St. Paul, 549 of which have been improved.

St. Paul is situated practically at the head of navigation of the Mississippi River. It is an important port of entry. United States custom officers inspect goods valued from $4,000,000 to $5,000,000 annually. The government is now constructing a series of dams and locks which will make it possible for vessels to proceed as far as St. Anthony Falls. When the improvements along the entire course of the Mississippi River are completed, St. Paul and Minneapolis will occupy an enviable position for water transportation. At present the Mississippi Warrior Service of the Inland Waterways Corporation, operates sixty barges and fifteen tow boats, which serve the city.

St. Paul is situated 409 miles by rail northwest of Chicago and has 59,598 miles or nearly one-fourth of the total railroad mileage of the United States entering this terminal. There are ten trunk lines operating out of St. Paul, all of whom use the Union Station which facilitates easy transportation accommodations. This station was erected at a cost of $15,000,000 and was built to replace the old one destroyed by fire in 1913. The Railway Exchange Building is one of the largest railroad offices in the world. It was constructed at a cost of $3,500,000.

The Capitol Building occupies a very imposing site, erected on a hill with an elevation of 875 feet. It is constructed of Georgian marble. The process of construction spread over thirteen years and upon completion had cost the State $5,000,000. Several leading architects and artists contributed to the decorations and beauties of the edifice. Of particular note among these contributors are La Farge, Volk, Pyle, Walker, Cox, Blashfield, Simmons and Millet. The dome of the Capitol rises 220 feet above the foundation. The St. Paul City Hall and County Court House, of Gothic architecture, is one of the most outstanding structures in the city. Among the other important buildings of the city are the Post Office, the Public Library and the Auditorium which has a seating capacity of 10,000. Among the more important buildings are the Pioneer, New York Life and Guardian Life Insurance Buildings; Hill Building and the Merchants National Bank.

St. Paul maintains an excellent school system with a total attendance of 57,459 pupils. There are seventy-four grade schools, seven Junior high schools, six Senior high schools, thirty-nine parochial schools and nine private schools in the city. Among the institutions of higher learning are Hamline University, a Methodist institution; Macalester College (Presbyterian), and St. Thomas Military School (Roman Catholic).

South St. Paul stockyards serve as a livestock metropolis for the entire northwestern section of the United States and Canada. The principal industry of the city is wholesale jobbing, including groceries, hardware, clothing, furs, paper and printers' supplies, automobile accessories, hats and caps. St. Paul is the second largest butter producing city in the country. Other important industries include the manufacturing of boots and shoes, hats and caps, railroad and foundry parts, automotive manufacturing and assembling plants.

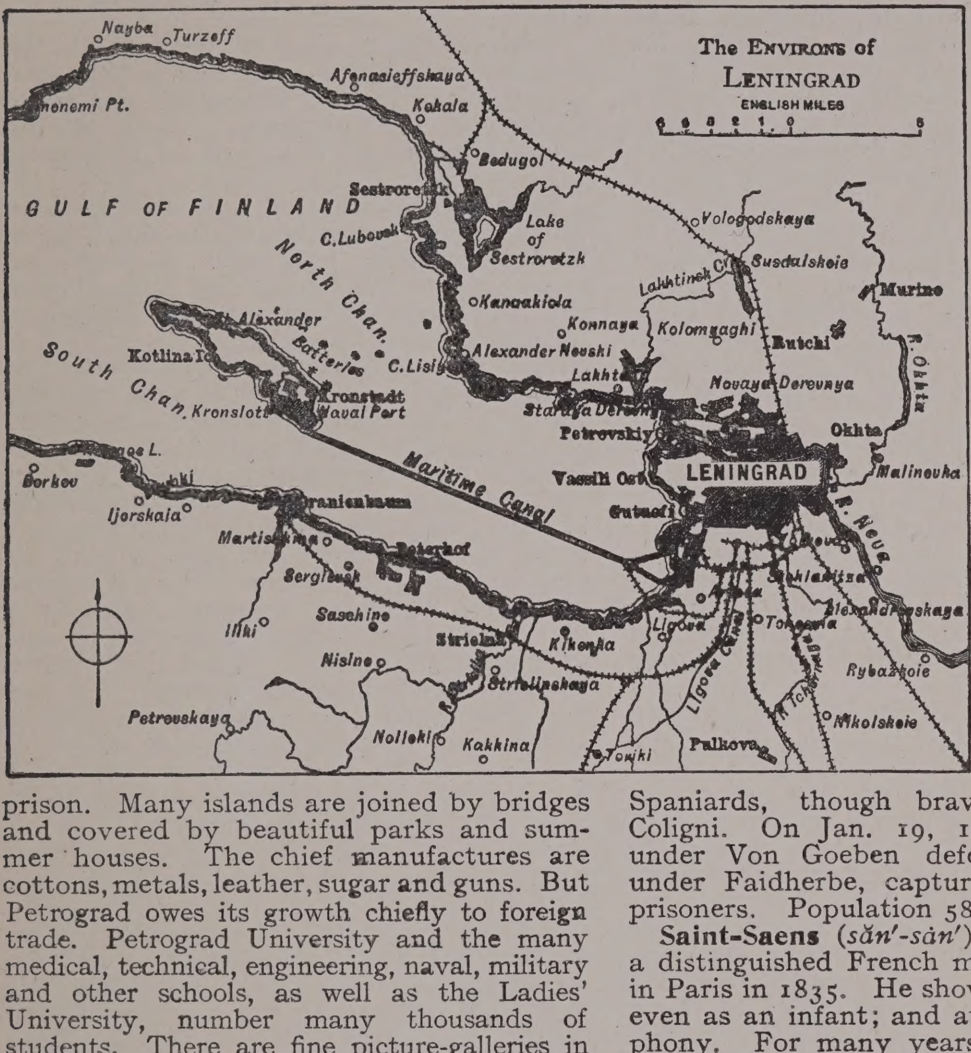
The population of St. Paul in 1930 was 271,606, an increase of 36,908 in the decade between 1920 and 1930. Many Scandinavians and Germans are residents of the city. There are fifty-two newspapers published in St. Paul, many of them are printed in the languages of these countries.

The city is governed by the Commission form of government, consisting of a Mayor or Comptroller and six commissioners. The departments of city government include Public Safety; Education; Public Works; Parks; Playground and Public Buildings; Public Utilities, and Finance.

An Indian village stood on the present site of St. Paul when white men first visited this region. The name of the city as referred to by the Indians meant "White Rock." This was descriptive of the white sandstone cliffs which border the river. French fur traders stopped here as early as 1658. It is believed that John Carver from Connecticut in 1766 made a treaty with the Indians by which he was ceded Carter's Cave and the territory which is now the present site of the city. Lieutenant Zebulon Pike, during Jefferson's administration bought a large section of ground, including Fort Snelling and St. Paul from the Indians for sixty gallons of whiskey. The Indians received $20,000 in cash for this land from the National Congress at a later date. In 1840 there were 200 inhabitants settled here, composed chiefly of Frenchmen who traded with the Indians. In 1849 the village boasted of thirty-two buildings and it was chosen as the capital of the territory. St. Paul was the key trading post with an outlet to the East and all trails and routes to the great Northwest leading out of the village. Fur was the chief commodity, with groceries, ammunition, clothing, tobacco, guns and farm implements exchanged for the many skins that were trapped in the surrounding region. The furs from the Red River Valley were trekked to this market. A city charter was granted in 1854, and three years later a constitutional convention drafted the State Constitution in St. Paul.

St. Petersburg, now **Leningrad,** is situated at the head of the Gulf of Finland and at the mouth of the Neva. It was the former capital of the Russian Empire. The city is built on flat and low marshy ground, from which the sea is slowly receding. The delta of the Neva divides into many branches, thus producing 100 islands, which all the time are getting larger. In this way nearly 600 acres have been added to Leningrad in the last 150 years. High winds sometimes raise the sea and flood the poorer parts of the city. In 1777, 1824 and 1891 rises of ten or more feet covered almost the entire city with water. Leningrad is surrounded by wildernesses, the nearest city being Novgorod. It is almost wholly cut off from the rest of Russia. The chief connections are by railway and by the Neva which is joined by canals with the Volga. Founded by Peter the Great in 1702, the city has spread over the banks and islands of the Neva and now covers forty-two square miles. A bar at the mouth of the river made Cronstadt, on an island sixteen miles west, the real port, but the building of a ship-canal twenty-two feet deep, now allows ships to unload within the city itself. Most of the city, the finest part, is on the mainland, bordered by a granite quay, with palaces and mansions stretching along the Neva for two and one-half miles. The old Admiralty with its gilded spire is the center of the main part of Leningrad. From it starts the Nevski Prospekt, one of the finest streets in the world, not so much for its houses as for its great width and length, its crowds and carriages. East of the old

Admiralty rises the huge and magnificent mass of the Winter Palace. On the island of Vasilievski are the stock-exchange, the University, the Academy of Sciences and the Academy of Arts. On Petersburgski Island stands the old fortress of St. Peter and St. Paul, containing the mint, the cathedral, in which the members of the imperial family are buried, and a political prison. Many islands are joined by bridges and covered by beautiful parks and summer houses. The chief manufactures are cottons, metals, leather, sugar and guns. But Petrograd owes its growth chiefly to foreign trade. Petrograd University and the many medical, technical, engineering, naval, military and other schools, as well as the Ladies' University, number many thousands of students. There are fine picture-galleries in the Academy of Arts and the Hermitage. The imperial public library has 1,200,000 volumes and 40,000 manuscripts. Population 1,870,000. Shortly after the Great War began, St. Petersburg was changed to "Petrograd," "grad" being Russian for "burg," which is German.


The ENVIRONS of LENINGRAD
ENGLISH MILES
Nayba
Turzeff
Afenasieffskaya
Kokala
Bedugol
Sestroretzk
GULF OF FINLAND
C. Lubovsk
Lake of Sestroretzk
North Chan.
Vologodskaya
Susdalskeie
Lakhtinsk
Murino
Kanaakiola
Konnaya
Kolomyaghi
Alexander
Batteries
Alexander Nevski
C. Lisiy
Butchi
South Chan.
Kotlina I.
Kronstadt Naval Port
Kronslott
Lakhta
Novaya Derevnya
Staraya Derevnya
Petrovskiy
Okhta
R. Okhta
Maritime Canal
Vassili Ost.
LENINGRAD
Malinovka
Borkov
Ijorskaia
Oranienbaum
Gutuevi
R. Neva
Martishkino
Peterhof
Sergievsk
Saschino
Ilki
Strielna
Kikenka
Ligova
Tokesvia
Alexandrovskaya
Nisino
Strielinskaya
Rybatzkoie
Ligova Canal
R. Tchernaya
Petrovskaya
Nolleki
Kakkina
Toriki
Pulkova
Nikolskeie

Saint-Pierre (*săn'-pyâr'*), **Jacques Henri Bernardin de,** was born at Havre, France, Jan. 19, 1737. As a boy he made a voyage to Martinique and studied at Caen and Rouen. He worked for a while as an engineer, made voyages and journeys, was a disciple of Rousseau, and wished to found an ideal state on the shores of the Sea of Aral. It was not till 1771 that his first book appeared, *Voyage to the Isle of France*, which at first was hardly noticed. He is remembered chiefly as the author of the beautiful story of *Paul and Virginia*, which was quickly scattered over Europe in English, Italian, Spanish, Dutch, Polish and Russian translations. Napoleon took it with him on his Italian campaign, re-read it at St. Helena and heaped many favors on St. Pierre, which enabled him to spend his old age comfortably among his flowers at his country house at Éragny, where he died on Jan. 21, 1814.

St. Quentin (*săn-kän'tăn'*), a French city on the Somme, 95 miles northeast of Paris. The church of St. Quentin and the town-hall are fine Gothic buildings. There are large cotton and other mills, and vast quantities of embroidery are made. Two important battles were fought here. Spanish and English troops won a victory over the French under Montmorenci in 1557, followed by the surrender of the city to the Spaniards, though bravely defended by Coligni. On Jan. 19, 1871, the Germans under Von Goeben defeated the French under Faidherbe, capturing nearly 10,000 prisoners. Population 58,571.

Saint-Saens (*săn'-sän'*), **Charles Camille,** a distinguished French musician, was born in Paris in 1835. He showed musical talent even as an infant; and at 16 wrote a symphony. For many years he was organist at the Madeleine Church in Paris. His earlier operas were unsuccessful; but his *Henry VIII*, *Ascanius* and *The Barbarians* have been well-received. Saint-Saens, however, is more famous as a composer of instrumental symphonies than of opera. He was an admirable performer as well as critic. He was made a commander of the Legion of Honor in 1894. No modern French composer has done more to maintain the classical tradition in instrumental music.

Saint-Simon (*sănt-sī'măn*), **Claude Henri,** Count of, the founder of French socialism, was born at Paris, Oct. 17, 1760. Like other French nobles he showed his love for liberty by serving as a volunteer in the American Revolutionary War. However, he took very little part in the French Revolution, except to undergo a short imprisonment. His first work was *Letters of a Citizen of Geneva to His Contemporaries.* His last and most important was *New Christianity.* He suffered hardships from lack of means, often being without decent clothes and food. This poverty caused him to try to shoot himself, in which attempt he lost an eye, two years before his death, May 19, 1825.

Saint-Simon, Louis de Rouvroy, Duke of, was born at Paris, Jan. 16, 1675. He served as a soldier in the wars of Louis XIV and took a leading part as courtier and politician at court. He is remembered for his *Memoirs,* which were not published in full till 1830. They are a masterpiece of art and are said not to be equaled by any work of the kind yet written. He died at Laferté, March 2, 1755. See Henry Reeve's *Royal and Republican France.*

St. Thom'as, Can., county-seat of Elgin County, Ont., is a growing railway-center with 11,485 inhabitants, in the midst of a rich agricultural country and possessed of thriving manufactures.

St. Thomas (Portuguese Sao Thomé) constitutes with the island of Principé a Portuguese colony. It lies in the Gulf of Guinea, off the western coast of Africa. Its area is 360 square miles, its fertile valleys unhealthy, its windswept peaks salubrious. In 1900 it had a population of 37,776. The exports are largely cacao, coffee and cinchona. The population is almost wholly composed of negroes. It was discovered by the Portuguese on St. Thomas's day in 1471, and colonized by them in 1493. From 1641 to 1844 the Dutch occupied it.

St. Vin'cent, Cape, forms the southwestern corner of Portugal, off which two important battles have taken place. On June 16, 1693, the French fleet defeated the English Admiral Rooke, who lost 12 men-of-war and 80 merchantmen that were sailing under his convoy. On Feb. 14, 1797, the well-known battle was fought in which Earl St. Vincent, ably seconded by Lord Nelson, with 15 sail of the line and 7 frigates defeated the Spanish with 27 sail. This victory prevented the invasion of England by France.

Sainte-Beuve (*sănt'-bēv'*), **Charles Augustin,** the greatest literary critic of modern times, was born at Boulogne-sur-Mer, France, in 1804. His father died before his birth, and his mother had a hard struggle to find means to give her son a schooling. At 14 Charles went to Charlemagne College at Paris, and afterward studied medicine. In 1824 he began his literary career by becoming a regular contributor of *Le Globe,* a paper started in that year by one of his college professors. A review of Victor Hugo's *Odes and Ballads* made him a lifelong friend of that poet. His best work as a critic began in 1840, when he was made keeper of Mazarin Library. In 1849 he began to write, for *Le Constitutionel,* an article on some literary subject every Monday, and this was his work for 20 years. These *Monday Talks* fill 28 volumes, and on them his fame chiefly rests. Sainte-Beuve died at Paris, Oct. 13, 1869.

Ste. Cunegonde, a substantial suburb of Montreal and also in Hochelaga County, has 10,912 inhabitants. It lies southwest of the city.

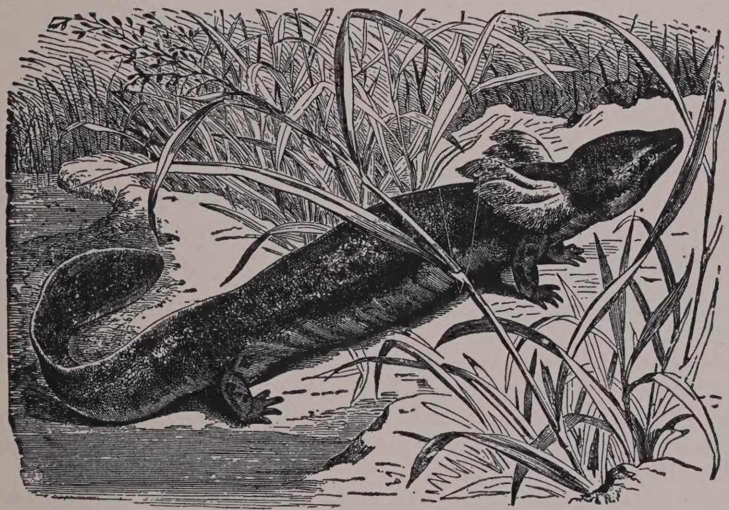
Saki (*sä'kĭ*), a kind of beer which the Japanese make from rice. It is the common drink of Japan. It is clear, and tastes unpleasant to Europeans. It is usually drunk hot, out of flat cups or lacquered-wood saucers.

Sal'aber'ry, Charles de, the hero of Chateauguay, a member of the old, French, landed nobility, had seen distinguished service under the British flag abroad when the War of 1812 broke out. He assisted in raising and took command of a regiment of French-Canadian *voltigeurs,* who saw a great deal of service in Lower Canada through the war. At Odelltown he resisted Gen. Dearborn with 2,000 men so successfully that the Americans were compelled to retire on Champlain. Salaberry was in command of the advance-guard, numbering not more than 350 men, at Chateauguay on Oct. 23, 1813, when Gen Wade Hampton with 3,500 Americans appeared. Stationing his main force behind breastworks and assigning small parties of men with bugles to posts well-separated through the surrounding woods, by repelling the frontal attack and pressing a counter-attack at the ford of the river he drove the enemy into precipitate retreat and inflicted heavy loss. For this he was knighted, and his men each received a medal. A monument to his memory was dedicated at Chateauguay in 1895.

Saladin (*săl'ȧ-dĭn*), the name given by western writers to Salah-ed-din Yusuf ibn Ayub, the sultan of Egypt and Syria. He was born in 1137 at the castle of Tekrit on the Tigris, of which his father, a Kurd, was governor under the Seljuk Turks. He rose to be grand vizier and in 1171 master of Egypt, overthrowing the reigning caliph. Three years later the emir died, and Saladin proclaimed himself Sultan of Egypt and Syria, a title which was confirmed to him by the caliph of Bagdad. He next conquered Mesopotamia and received the homage of the Turkish princes of Asia Minor. He then turned his attention to the Christians, utterly defeating them near Tiberias in 1187; next Jerusalem was stormed (Oct. 3); and almost every other fortified place on the Syrian coast was taken. The news of this great success aroused the Christians of western Europe, and a powerful body of crusaders, headed by the kings of France and England, soon appeared on the scene of strife. They captured Acre in 1191, and Richard Cœur-de-Lion defeated Saladin, took Cæsarea and Jaffa, and obtained a treaty for three years by which the coast from Jaffa to Tyre was yielded to the Christians. Saladin died at Damascus, March 3, 1193. Saladin was not merely a great soldier; his wise government left traces which lasted for centuries in the citadel of Cairo and in canals, dikes and roads. He lives in history as the Moslem hero of the third crusade and as the Moslem ideal of chivalry. The chivalrous side of his character is seen in Scott's *The Talisman.*

Sal′aman′ca, a Spanish city on the Tormes, 110 miles northwest of Madrid. From the 13th to the end of the 17th century it was the seat of one of the most renowned universities in Europe. In the 16th century there were from 6,000 to 8,000 students; now there are some 1,200. The library contains 70,500 volumes. The city, which once had a population of 50,000, is still surrounded with walls, pierced by ten gates. Its houses, convents, churches, streets and squares preserve much of their appearance during the middle ages. The great square was used for bullfights, and can hold 20,000 spectators. The town was captured by Hannibal in 222 B. C. The Moors were driven out of it in 1055. The French captured it in 1812. Population 24,000. Salamanca also is a province; area 4,829 square miles; population 320,765.

Sal′aman′der, a tailed amphibian, with a body shaped like a lizard and often mistaken for one of those reptiles. The group includes mud-puppies, newts and the like. They are abundant in many places both in the Old and the New World. Several kinds of *Amblystoma* are very common in the United States. The commoner forms are six to eight inches long. They have blunt noses, and are dark-colored with yellow spots and blotches. They lay their eggs in quiet waters, preferring small ponds in which the water is easily warmed. The eggs are hatched into tadpoles, with external gills. The tadpoles grow to a length of five or six inches before the gills are dropped and replaced entirely by lungs. The adults live on land, going into the water to lay eggs. Some salamanders, like the Mexican axolotl and the common mud-puppy (*Necturus*), live habitually in the water and retain their external, feather-like gills throughout life. The salamanders are divided into those which retain and those which lose their gills. Most salamanders lay eggs, but one form (*Salamandra atra*), living on the Alps, brings forth living young. Though regarded with fear by many people, salamanders are harmless.



COMMON MUD-PUPPY, WITH EXTERNAL GILLS

Salamis (*săl′ȧ-mĭs*), **Battle of.** This great naval battle was fought between the Greeks and the Persians in 480 B. C., a few days after the battle of Thermopylæ, in the narrow strait between the island of Salamis and the coast of Attica. The Greek fleet of 366 triremes was drawn up at the entrance of the bay forming the harbor of the town of New Salamis, the Athenians under Themistocles, the Corinthians under Adimantus, while the Spartan Eurybiades commanded the whole. Quarrels among the Greek leaders would probably have caused the fleet to break up, had not Themistocles by a stratagem got Xerxes, the Persian king, to bring up his fleet and give battle at once. Xerxes drew up his fleet, numbering 1,200 triremes and 3,000 smaller vessels, during the night before the battle, to block both entrances to the strait. Sure of victory, he took his seat on a throne on a lofty height on the Attic coast. Both Greeks and Persians fought with great bravery, but the latter were defeated, the Greeks being victorious in one of the most important sea-fights of history. It was one of the world's decisive battles.

Sa′lem, a city in the south of India, 120 miles southwest of Madras. It stands in a valley backed by hills. It has large cotton-mills and a good general trade. Population 70,621.

Salem, Mass., city, settled 1626, chief county-seat of Essex County, on the Boston and Maine Railroad, Eastern Division, 17 miles by rail northeast of Boston. Its harbor, an arm of Massachusetts Bay, is well-sheltered and commodious, but of insufficient depth for the largest vessels. The city is a popular resort for people interested in early American settlements, possessing many historic localities and buildings. Essex Institute contains a large collection of relics and portraits and a library of 82,850 volumes and 285,922 pamphlets and serials, many of which treat of historic subjects. East India Marine

Museum has a rare exhibit of ethnological value and many other objects of varied interest. The Athenæum contains 25,000 volumes, and the free public library has upward of 40,000. Besides a well-sustained system of public schools, it has three parochial schools and is the seat of a flourishing state normal school. It has 21 churches, a Y. M. C. A. organization, with a fine, large building, an endowed institution for work among boys, known as Salem Fraternity, and a well-equipped and well-endowed hospital, which accommodates 100 patients. The city has been unjustly identified with the witchcraft delusion of 1692 from the fact that the courts sat here at which the accused were tried. The recovery from this delusion was earlier here than in other parts of this country or in England. (See MATHER, COTTON, and WITCHCRAFT). The city formerly enjoyed a large and extensive foreign commerce. This has become superseded by an extensive coasting-trade, of which the reception of coal for distribution by rail and the shipment of ice form the chief items. Population 43,697.

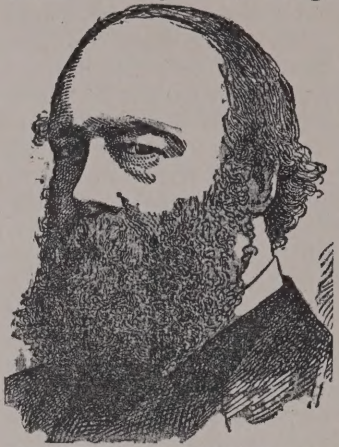
Salem, Or., the capital, is on Willamette River, 52 miles southwest of Portland. It has good water-power and some manufactures. Here are the capitol, penitentiary, insane asylum, schools for the blind, deaf and dumb and feeble-minded, besides Willamette University (Methodist) and an excellent system of public schools, enrolling 2,000 pupils and employing 45 teachers. Salem was settled in 1834, and became the capital in 1860. It is served by the Southern Pacific Railroad, and has electric connection with Portland. Population 20,000.

Salerno (*sȧ-lẽr′nṓ*), a city of southern Italy, on the Gulf of Salerno, 33 miles southeast of Naples. An old Norman castle surmounts the hill behind the city. The beautiful Gothic cathedral of St. Matthew has a quadrangle of porphyry and granite pillars in front of it. The city was celebrated in the middle ages for its university. Population 42,727.

Sal′ic Law, a collection of the popular laws of the Salic Franks, in which the succession to what are called Salic lands was confined to males, probably from the importance of getting military service from the chief land-owners. This law was afterwards applied to the succession to the French crown.

Salisbury (*salz′bẽr-ĭ*), a cathedral city of England, stands near Avon River (not Shakspere's), 84 miles southwest of London. Its famous cathedral is built in early English style, and is 473 feet long and 111 wide, the spire is the highest in England — 400 feet. In the large close which surrounds the cathedral is the bishop's palace. Blackmore Museum contains a fine collection of American antiquities. Among the bishops have been Cardinal Campeggio, Jewell, Hooker, Fuller, Barrow, Liddon and Wordsworth. Old Sarum, a mile north of the present city, was a castle and a place of importance in Roman times. Here Canute died, and here William the Conqueror gathered the barons to renew their oath of fealty. Population 21,900.

Salisbury, Robert A. T. Gascoyne Cecil, Marquis of, English statesman and prime minister, was born at Hatfield, Herts, Feb. 3, 1830, and educated at Eton and at Christ Church, Oxford. In 1866 he entered Lord Derby's ministry as secretary of state for India (under the title of Lord Cranbourne). On the death of his father in 1867, he entered the house of lords and took rank as the foremost debater in the upper chamber. In 1878 he acted as joint plenipotentiary of Great Britain at the Congress of Berlin, and two years later became secretary of state for foreign affairs. When the Earl of Beaconsfield died in 1881, Lord Salisbury became the recognized leader of the Conservative party. When the Gladstone ministry resigned in 1885, he became premier and secretary for foreign affairs. Owing to feeble support received by his government he resigned affairs to Mr. Gladstone, but, on the latter being defeated on the second reading of the Irish Home-Rule bill, he again returned to power. In 1892 Mr. Gladstone and he once more exchanged the premiership, and in 1895, on the resignation of Lord Rosebery, Lord Salisbury formed his third adminstration, in coalition with Liberal-Unionists, from which he retired in 1902. In 1864 he was elected chancellor of the University of Oxford. In his younger days he was a contributor to *The Quarterly Review*, but later found relaxation from the cares of office in his laboratory, where he experimented in chemistry and electricity. He died on Aug. 22, 1903.


MARQUIS OF SALISBURY

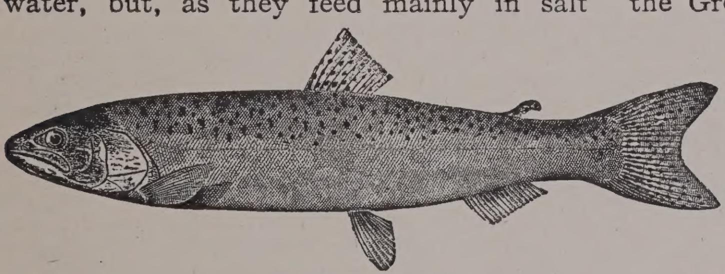
Saliva (*sȧ-lī′vȧ*), one of the digestive fluids, is mainly the product of the salivary glands, of which there are three kinds, named from Greek and Latin words denoting their position — the parotid, the submaxillary and the sublingual, with ducts or canals which carry the saliva into the mouth. Here it is mixed with mucus, from the mucous membrane lining the mouth, forming ordinary or mixed saliva.

The parotid gland is the largest of the three glands, found on each side. It lies on the side of the face just in front of the ear. Its duct is about two and a half inches long and opens into the mouth opposite the second molar tooth of the upper jaw. The submaxillary gland is below the jaw-bone; and the sublingual gland is under the tongue on the floor of the mouth. Salivary glands are found in most of the higher animals except fishes.

Sallee′, a seaport of Morocco, stands on the Atlantic, at the mouth of the Bu-Rakrak. It for centuries was notorious as a haunt of pirates, who carried the terror of their name far and wide and known to every reader of *Robinson Crusoe*. The people, 10,000 in number, allow no European to dwell within their walls, though a stop was put to their piracy at the beginning of the 19th century. Population about 10,000.

Sal′lust, a Roman historian, was born of a plebeian family at Amiternum, in the Sabine country, 86 B. C. As a follower of Cæsar, he rose to be tribune in 52 and prætor five years later. He took part in Cæsar's African campaign, came near being killed in a mutiny of some of the troops, and was made governor of Numidia. This office enriched him, and enabled him to lay out beautiful gardens on the Quirinal, which bore his name for centuries, and to build the palace used afterwards by Emperors Nerva, Vespasian and Aurelian. Here he wrote his famous histories, *Catiline*, *Jugurtha* and the *Five Books of History*, of the last of which only a few fragments are known. Sallust died in 34 B. C.

Salmon (*săm′ŭn*), several species of fish belonging to the trout family and ascending rivers to spawn. They, of course, are found abundantly during migration in fresh water, but, as they feed mainly in salt water, they may be regarded as marine fishes. They occur on the shores both of the eastern and the western continent. They are essentially cold-water fish, in Europe ranging north of Spain and on the eastern coast of North America from Maine northward, being sometimes found as far south as the mouth of the Hudson. The salmon of the Pacific, so abundant in Columbia and Yukon Rivers, belongs to another genus. This kind is more tolerant of warm water and occurs on the coast and in rivers in California. The red salmon is found especially at home in Puget Sound. The North Atlantic salmon is brownish above, with silvery sides spotted with black. Some salmon flesh is not pink or red in color. This peculiar shade is due to seasonal changes in some species, and the coloring is no indication of the value of the flesh as food. Similar forms to the North Atlantic salmon are found in Great Britain, Europe, Eastern Asia, and Japan. Salmon ascend the Yukon River, in Alaska, to a distance of 1500 miles, and the Columbia River and Puget Sound waters are world-renowned fishing grounds for certain species in northwestern United States. The king salmon is the largest, and is known to reach a weight of 100 pounds, although the average weight is about 22 pounds. The average weight of the red salmon is about seven pounds. In migrating, salmon are able to leap over vertical waterfalls ten to fifteen feet high, which feat they accomplish by holding their tails in their mouths, then suddenly releasing, striking the water with sufficient force to carry them over. In going up stream, they never yield in their endeavor, and those who fail to mount, die in the effort. The young fish first live in fresh water streams. During the latter part of their second year, while still very small, they migrate to salt water. There they spend two years, and grow to maturity. Then comes the heavy migration up stream to spawn, which general movement occurs in March and April especially. While the female lays her eggs the male zealously guards both her and the eggs from hungry water adversaries. This work accomplished, the salmon float backward slowly down stream, and die. See Traherne's *The Habits of the Salmon.*



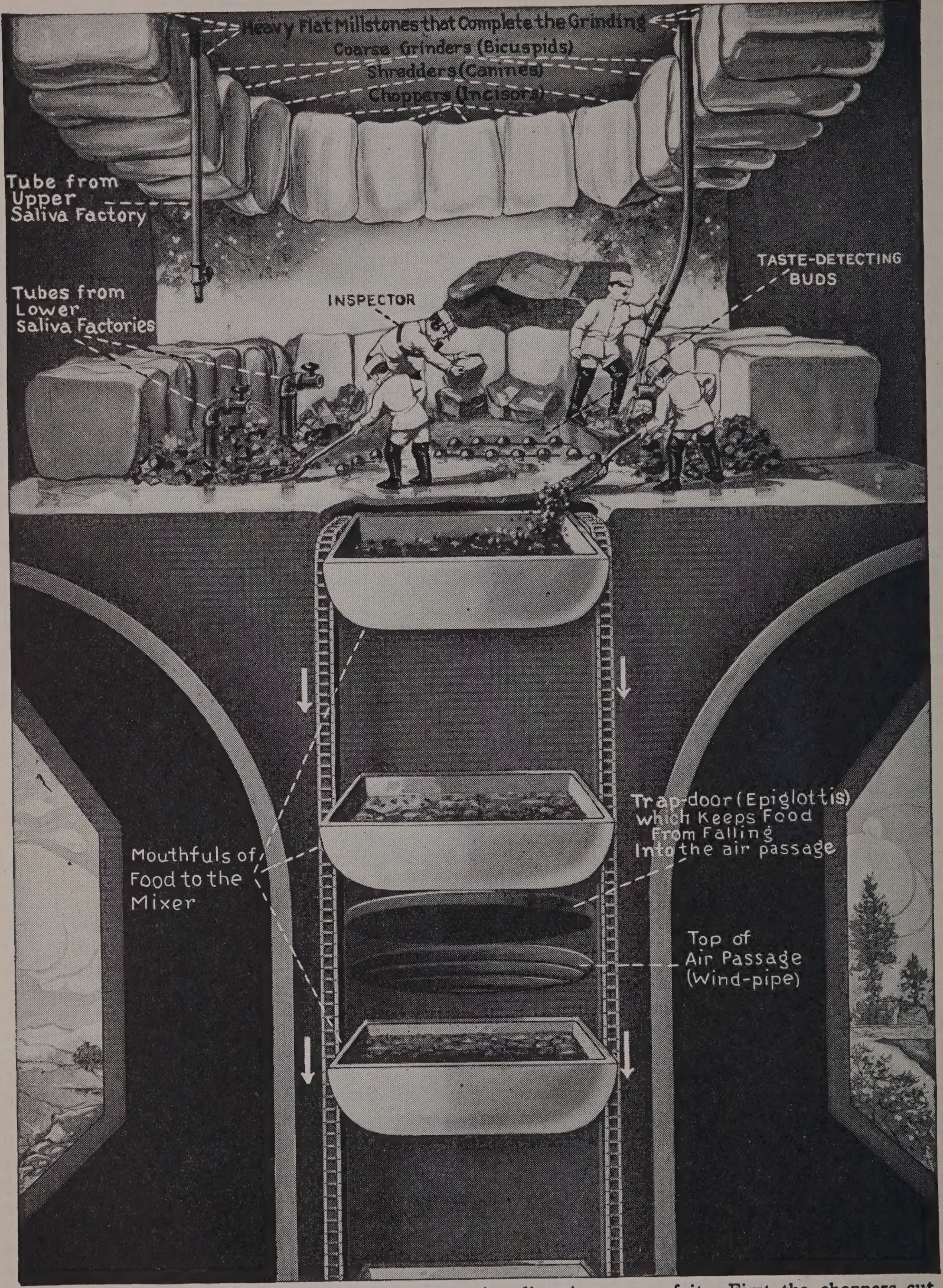
KING-SALMON

Salome′, a feminine name common in Palestine in the days of Christ. The notable Salome was the granddaughter of Herod the Great, who married her uncle Herod, the tetrarch. She appears in the Gospels as a young girl who was instigated by her mother, Herodias, to ask the execution of John the Baptist. Her skillful dancing induced Antipas to make the rash vow that led to the death of the prophet.

Salome, an opera by Richard Strauss, has been the subject of much discussion in musical circles and even of popular protest in France and the United States. It portrays the story of Salome and her dance before Herod and his guests, being based on the one-act drama of Oscar Wilde, who imputes to Salome a passion for the prophet which leads her to repulsive actions. The keynotes are passion, terror and overshadowing destiny.

Salonica (*sä′lō-nē′kȧ*) or **Saloniki**, the most important city for trade in European Turkey after Constantinople. It stands at the head of the Gulf of Salonica, and since 1889 has been joined to Belgrade and

WHERE THE BUSY MILLERS WORK


Heavy Flat Millstones that Complete the Grinding
Coarse Grinders (Bicuspids)
Shredders (Canines)
Choppers (Incisors)
Tube from Upper Saliva Factory
TASTE-DETECTING BUDS
INSPECTOR
Tubes from Lower Saliva Factories
Trap-door (Epiglottis) which Keeps Food From Falling Into the air passage
Mouthfuls of Food to the Mixer
Top of Air Passage (Wind-pipe)

Here is the mill that grinds the food and begins digesting some of it. First the choppers cut it up into convenient size for the grinders. Next are the shredders for tearing meats. Then come the coarse grinders, and lastly, the flat stones that do the fine grinding. Those little buds tell the quality of food by the taste. Things that don't taste right are thrown out. The saliva pours in by those pipes, is mixed with the food, softens it and digests the starches. Mouthfuls of food (indicated by the carriers) pass to the mixing room and, in passing, close the door into the aerating room (the lungs) to keep you from getting things into your "Sunday throat."

Vienna by rail. It has a fine appearance from the sea, as it is surrounded by white walls five miles long, and its houses and mosques are shaded by dark-leaved trees, while a citadel, the old Acropolis, looks down from the rocky heights above it. The main buildings are the mosques, most of them now Christian churches; among them are St. Sophia, St. George and St. Demetrius. The old mosque once was a temple of Venus. Here is the court of the hippodrome where Theodosius ordered the massacre of 7,000 citizens. *Via Equatia*, the highroad from Rome to Byzantium, passes through the city. Trade is steadily growing, especially since the opening of the railroad to Servia Cotton, flour, soap, bricks, leather, silk and carpets are among its manufactures. Salonica is the Thessalonica of the Christians, to whom St. Paul wrote *Thessalonians I* and *II*. The town was founded by Cassander in 315 B. C., who named it after his wife, sister of Alexander the Great. Population about 275,000; of whom nearly 100,000 are Jews of Spanish descent, 50,000 are Turks and 70,000 Greeks. Salonica also is a vilayet in Turkey; area 13,510 square miles; population 1,330,800.

Salt. Common salt is chloride of sodium (NaCl). It occurs in nature both in beds or strata, when it is called rock-salt, and in solution in water. Aside from the sea and from salt lakes, the underground waters of many regions contain salt. The salt of commerce is partly mined from the beds of rock-salt, partly extracted from salt waters. In the latter case the brine may be natural, as in the case of the sea, salt lakes and salt wells; or artificial. In the case of artificial brines fresh water is allowed to flow over beds of salt, and from the resulting solution salt is extracted. In the extraction of salt from salt water two general processes are in vogue. In one the water is allowed to evaporate in the open air under the influence of the sun; and in the other evaporation is hastened by means of artificial heat. By the former process the *coarse salt* and by the latter the *fine salt* of commerce are obtained. Beds of rock-salt represent deposits from solution on the bottoms of salt lakes, lagoons etc. In some lakes, as Great Salt Lake, such deposits are being made at the present time. Similar deposits have been made in the past, and subsequently buried by other sediments, as sand, mud etc. Some of these beds of salt were made millions of years ago. Some are hundreds of feet thick. The salt in solution in underground waters may have been derived from salt-beds over which the waters seeping in from the surface have passed, and some of the natural brines may represent sea-water with which the sediment was originally filled and which has never been drained out. The thickest salt-beds of this country, so far as now known, are on the coast of Louisiana, on Avery's Island (*Petite Anse*). Other salt-beds occur in New York, Pennsylvania, Ohio, Michigan and Ontario, Canada. The output of salt in the United States in 1906 was 28,172,380 barrels (280 lbs. per bbl.), value $6,658,350. The United States produce more salt than any other country. Great Britain, Russia, Germany, France, India, Spain and Italy are great producers in the order named.

Salt Lake City, capital of Utah, is on Jordan River, twelve miles from Great Salt Lake and 4,265 feet above the sea. It covers twelve square miles. Its streets are 132 feet wide, shaded by fine trees, many of them freshened by streams of running water from the neighboring mountains, and lighted by electricity. The finest public buildings are the Mormon temple, which cost $4,000,000, with walls built of dressed granite, twenty feet thick at the bottom, tapering to six feet at the top; the tabernacle, a huge building in the shape of an ellipse, with a dome-shaped roof resting on sandstone pillars, and seating 7,000; and the city and county building. Though Mormon influence is strong, there are many other denominations represented such as Roman Catholic, Episcopalian, Presbyterian, Congregational and Methodist. Utah possesses iron ore, limestone, and more coal than the Ruhr, and is becoming a great iron and steel center. The Salt Lake valley is the world's largest smelting center, copper and silver deposits being very extensive. The city is the center of large mining-industries, and has smelting-works, flour and paper mills, foundries, machine-shops, cement and tanneries. It has good free public schools, supported at an annual cost of $1,500,000, and an enrollment of 35,500. Here is the University of Utah, a coeducational institution supported by the state, having 53 instructors and 957 students, including the preparatory department. There are also many denominational schools. Salt Lake City was founded in 1847 by Brigham Young who, with a company of Mormon pioneers, left Council Bluffs in the spring to find a site for the future Mormon capital. For years the growth of the city depended upon the inflow of Mormon immigrants, but later the mines in its vicinity attracted Gentiles or non-Mormons. The population of the city is 140,000.

Salt'peter or **Ni'ter** is potassium nitrate (KNO_3). It generally is in long, colorless, six-sided prisms. Its taste is cooling and very salty. It dissolves in water but not in alcohol. Mixtures of niter and carbon or of niter and sulphur or of all three explode with great energy on applying heat. If saltpeter be thrown on glowing coals, it flashes briskly. Niter is found in India and Persia as a natural product, on the soil or scattered through the upper rocks. But most saltpeter is now made from the Chilean sodium nitrate. Niter is used in making sulphuric acid, nitric acid, fireworks and, especially gunpowder. It also is a medicine. Sodium nitrate is found abundantly on the surface of the soil in Chile and Peru in the form of cube-like crystals, and so is often called cubic niter. Besides its use in the manufacture of saltpeter, it is a valuable fertilizer. In 1905 1,688,976 tons of this nitrate or Chilean saltpeter, as it is called, were shipped from Chilean ports. See W. H. Russell's *Visit to the Nitrate Fields of Tarapacá*.

Salts make a very important class of substances in chemistry, of which common salt or sea-salt is the most familiar example. Epsom salts, saltpeter and Rochelle salts are other well-known salts. Common salt was known from the earliest times, and the name was given to other substances from the greater or smaller likeness of these to common salt in appearance, taste, solubility etc. But many substances, which have entirely different physical properties, are now called salts by chemists, and it is not necessary, from a chemical standpoint, that a salt should be white, soluble in water or have a salty taste. By a salt is ordinarily meant a substance that may be got from an acid by replacing part or all of the hydrogen of the acid by a metal, or a substance capable of playing the part of a metal, as ammonium. For example, when nitric acid and oxide of lead act upon each other, the acid loses its hydrogen, the place of which is taken by the lead, thus forming lead-nitrate, while the hydrogen of the acid and the oxygen of the lead-oxide combine to form water. In neutral or normal salts the hydrogen of an acid has been wholly replaced by a metal; in acid salts only partially replaced; and in basic salts more than replaced, there being more atoms of metal in the salt than there were atoms of hydrogen in the acid.

Salvador (*săl′vȧ-dŏr′*), the smallest but most thickly populated of the Central American republics, is 140 miles long and on an average 60 miles wide. It covers 7,225 square miles, and is about as large as New Jersey. The bulk of Salvador is a level plain, 2,000 feet high, cut by rivers and broken by many volcanic peaks from 4,900 to 6,900 feet high. Some of these volcanoes are still active, and Izalco has been in eruption for over a hundred years. On the northern frontier is a portion of the Central American cordillera. The chief rivers, all of which flow to the Pacific, are the Lempa, which receives the waters of Laguna de Cuija, a large lake on the borders of Salvador and Guatemala, and the San Miguel. The well-watered and rich soil is divided into small farms, which will yield four crops of corn a year. The main products are coffee, indigo and balsam; the balsam grows only on one part of the seaboard, called the balsam-coast. Gold, silver, coal and iron are found, but the metal yield is not great. The bulk of trade is with the United States and Great Britain. The whites number only 20,000 most of the people being Indians or of mixed race. The Indians are Aztecs, speak Spanish and are Roman Catholics. A president, chosen for four years, a cabinet of four secretaries and a congress elected once a year carry on the government. Education is free and compulsory. The army numbers 3,000 men, besides 18,000 militia. A railroad connects the capital, San Salvador (population 60,000), and the chief port, Acajutla. Another road is planned to run from La Union, the best harbor, to San Miguel and thence to San Salvador. Salvador's first name was Cuscatlan. Pedro de Alvarado had great trouble in conquering it in 1525–6. The country freed itself from Spain in 1821, and two years later joined the Central American Confederacy. Since 1853 it has been an independent republic; it has been without foreign wars since 1864, with the exception of the short war with Guatemala in 1890. This war ended the proposed treaty of union between the five Central American states. Population 1,400,000, an average of 154 to the square mile. See Bates' *Central America*.

Salva′tion Army, a religious body which was founded in England in 1865 by the Rev. William Booth. The Salvationists' beliefs do not differ greatly from those of other Christians, but their methods are entirely new. Mr. Booth's idea was to reach the poorer classes of London by means of a military organization, and in this work he was ably seconded by his wife. The name of Salvation Army was adopted in 1878, and its head was thereafter known as General Booth. Its growth has been wonderful, there now being 7,316 posts, with 20,054 officers, in fifty-one countries in every part of the world. A country is mapped out into districts, each under the care of a major. Every large town in a district is occupied by one or more corps under a captain, with lieutenants to assist him. Their work is to carry on daily services indoors and out of doors, care for recruits and work in every way for the salvation of souls, and they are supported by the army. Services are held in the streets, with processions, accompanied by banners, drums and tambourines. All are bound to abstain from liquor and to lead unselfish lives One who can hardly read is as welcome as the cultured, and women as well as men are enlisted and can hold any position. The army is supported by offerings, gifts and the profits of their press, of which *The War-Cry* is the best-known. The army periodicals, issued in 24 foreign languages, have a circulation of 1,207,000 weekly copies. Counting books, song-books etc., their publications have a circulation of nearly 4,000,000 a month. In 1890 a scheme for uplifting the out-of-work and homeless multitudes, set forth in General Booth's book, *In Darkest England and the Way Out*, attracted wide attention, and funds were collected to enable him to carry out his plan. By this plan out-casts are first taken into a city-colony, given shelter and food and offered work. If found willing to work and do right, they are then sent to the farm-colony and afterwards shipped to the colony over the seas as emigrants. In 1896 Ballington Booth, son of General Booth, who had for some years been in charge of the Salvation Army in the United States, separated from the parent society and established a new organization, named The Volunteers of America. In character, aims and methods this organization is similar to the Salvation Army. See General Booth's book and his *Aggressive Christianity*.

Salvini (*sȧl-vē'nē*), **Tommaso,** was born at Milan, Italy, Jan. 1, 1830, of a family of actors. The boy had a good training and became well-known as a member of Ristori's company. In 1849 he fought in the war for Italian independence, after which he went back to the stage. He played tragic parts, especially Œdipus, Saul and Othello. He was popular and successful at Paris, Madrid, Brussels, in England and in the United States, which he visited in 1874 and 1881. In 1884 Salvini left the stage and retired to his villa near Florence. He died in 1896.

ALEXANDER SALVINI, son of the above, followed his father's profession, and gained considerable reputation, appearing successfully in the United States in the *Three Guardsmen* and other plays.

Samarcand (*sȧm'ȧr-kănd'*), a city of western Turkestan, 130 miles southeast of Bokhara in Russia in Asia. Under its old name of Maracanda it was taken and destroyed by Alexander the Great. Since its capture in 712 A. D. by the Arabs, it has been a sacred Moslem city. Genghis Khan took it in 1219 and killed three fourths of its half million people. Timur the Great made it his capital in the 14th century, when it had a population of 150,000. From Timur's time date its finest buildings, as the Ulug-bed College, the tombs of the conqueror and his wives and the great stone which he used as a throne. Samarcand had a checkered history from the decay of Timur's empire, till in 1868 it was taken by the Russians from the emirs of Bokhara. A railroad now joins Samarcand to Merv and the Caspian Sea. The many gardens are irrigated; manufactures of harness, pottery etc. are carried on; and there is a brisk trade in silk, rice, horses etc. A garrison of 6,000 Russians holds the citadel, which is built on a steep hill. Population 58,194.

Sama'ria, the capital of the northern kingdom of Israel, after the ten tribes became independent of Judah. It was founded by Omri. It was about five miles northwest of Shechem, and thus near the middle of Palestine. It stood on the top of a hill 1,450 feet high, and was easily made a place of considerable strength. The Syrians besieged it in vain, but about 721 B. C. it fell before the attacks of the Assyrian kings, Shalmaneser and Sargon. Nearly all the Hebrews of the capital and country were carried captives into Babylonia. Their places were taken by Assyrian colonists. These settlers, though still keeping a good deal of their heathen ways of worship, adopted for the greater part the religion of the Israelites; but the refusal of the Jews to accept their help in rebuilding the temple at Jerusalem caused bitter feeling; and in 409 B. C. the Samaritans built a rival temple on Mt. Gerizim. This enmity between the Samaritans and the Jews became so great, that the "Jews had no dealings with the Samaritans" and the Samaritans none with the Jews. Alexander the Great captured Samaria, and brought there a colony of Greeks. John Hyrcanus, the Jewish captain, after a year's siege took Samaria and razed it to the ground about 110 B. C. But the Samaritans clung to the spot, and after a bloody siege by the Romans saw their city a second time destroyed. Samaria was, however, rebuilt, and held by Herod the Great. The place is now but a heap of ruins, and most of the Samaritans were, like the Jews, scattered to the four winds; yet as late as 529 the few left rose in rebellion against the Eastern Empire.

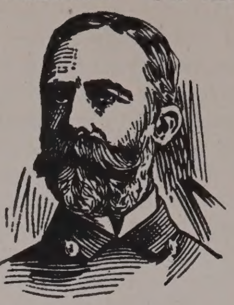
Samoa (*sä-mō'ȧ*), is the name of a group of islands in the Pacific, from 400 to 500 miles northeast of Fiji. All but one are of volcanic formation, and are mostly surrounded by coral reefs. They are mountainous, well-wooded, with rich soil. Only four are of any size. The largest, Savaii, is 47 miles long and 28 wide. Upolu has on its northern side the bay and harbor of Apia, while on the shore of the bay is Apia, the chief town of the islands. In the spring there are disastrous hurricanes. Copra, the dried kernel of the cocoanut, is the chief export. Cotton, coffee and tobacco are cultivated, and sugarcane grows wild. Steamers ply between Apia and San Francisco, Auckland and Sydney. The Samoans belong to the brown Polynesian race. They are a well-formed people, but lessening in numbers, the present population being about 35,000. The Frenchman Bougainville visited the islands in 1768, and called them the Navigators' Islands, from the skill of the native boatman. The natives are Christians. By treaty, in 1889, the United States, Great Britain and Germany assumed joint control of the islands. This arrangement continued in force till 1898, when King Malietoa Laupepa died, and disturbances arose regarding the succession. A joint commission which was appointed recommended, among other measures, the abolition of the kingship. The result was that, by the Anglo-German agreement of Nov. 14, 1899, accepted and ratified by the United States in January, 1900, Great Britain renounced all rights over the islands in favor of Germany as regards Savaii and Upolu and in favor of the United States as regards Tutuila and other islands.

In February, 1900, a naval governor was appointed for Tutuila. The island of Tutuila, 70 miles from Apia, has an area of about 54 square miles, with a population of 3,800. Manua and the other islets have a united area of about 25 square miles, with about 2,000 inhabitants. Tutuila is mountainous, luxuriantly wooded and fertile. It is described as the most pleasing of the Samoan islands. The harbor at Pago-Pago, which penetrates the south coast, is the only good harbor in Samoa. The two German islands, with an area of 1,000 square miles and total population of 35,000, passed to New Zealand in 1919 as mandatories of the League of Nations.

Sa′mos, an island in the Ægean Sea near the Asia Minor coast. It covers 180 square miles. A chain of mountains runs through the island. Between it and the mainland runs the mile-wide channel of Mycale, where in 479 B. C. the Persian fleet was routed by the Greeks. The main product is wine, though olive-oil, raisins and hides are also exported. Tanning is an important business. The capital is Vathy. The old city of Samos is now called Tigani. It was celebrated for its aqueduct, cut almost a mile through the heart of a mountain; a huge mole built to protect the harbor; and its temple to Hera. In early times famous red pottery was made in Samos. The Samians, like the Corinthians, were among the earliest and most daring sailors; a Samian is said to have first passed the pillars of Hercules into the Atlantic; and Samos was the mother of colonies in Thrace, Cilicia, Crete, Italy and Sicily. The island was mistress of the Ægean Isles under its greatest ruler, Polycrates (532–522 B. C.). No Greeks were more patriotic than the Samians in the War of Independence in 1821, but they were forced, though the rest of Greece became free, to remain in the hands of their masters, the Turks. The island is, however, governed by a Greek who is called Prince of Samos. Population is 54,840. See Tozer's *Islands of the Ægean.*

Samothra′ce or **Samothra′ki** is an island in the northeast of the Ægean Sea. Mt. Saoce, 5,248 feet high, takes up nearly its whole surface, sixty-eight square miles. From this peak Poseidon watched the combats on the plain of Troy. Samothrace for many years was a sacred spot, where were worshipped the strange gods known as the Cabeiri. In 1457 and again in 1821 the Turks killed nearly all its people. Population about 2,000. See Marston's *Greece and the Ægean.*

Samp′son, William T., rear-admiral of the United States navy, was born at Palmyra, N. Y., in 1840. He graduated at Annapolis, first in his class, in 1861. He was on the *Patapsco* when she was destroyed by a torpedo in Charleston harbor, 1865. He was made lieutenant-commander in 1866 and commander in 1874. He served six years as instructor at Annapolis and successively commanded the *Swatara, Iowa* and *San Francisco.* On the outbreak of the war with Spain he was appointed acting rear-admiral, March 26, 1898, and placed in command of the North-Atlantic squadron operating against Spain in Cuban waters. When the Spanish fleet under Cervera took refuge in the harbor of Santiago de Cuba, Sampson established a close blockade of that port, resulting in the destruction of the Spanish fleet when it attempted to escape from the harbor, July 3, 1898. At the close of the war he was made rear-admiral. He died on May 6, 1902.



WILLIAM T. SAMPSON

Sam′son "judged Israel twenty years." He was a Danite and a native of Zorah. At his birth he became a Nazarite, and in accordance with this vow his head remained unshorn and his lips never knew the taste of wine. The account of his marvelous feats of strength and his fall through his love for Delilah, a Philistine woman, forms one of the most interesting of Bible stories.

Sam′uel, the last of the judges, the first of the prophets and, next to Moses, the greatest man in the early history of Israel as a nation. He was an Ephraimite; and, set apart by his mother for the priesthood, he became a temple-attendant under Eli, the high priest, at Shiloh. While but a child he foretold the downfall of Eli and his house. Twenty years after his master's death he gathered the people at Mizpah, routed the Philistines, and governed the nation for twenty years. On the people's wishing for a king Samuel reluctantly anointed Saul and afterwards David as kings of Israel.

Samurai (*sä′mo͝o-rī*), the military class in the feudal days of Japan, were retainers of the *daimios* or nobles. Originally it would seem that the term was restricted to the guards of the imperial palace; but it became so generalized as to include all whose profession was war. The *samurai* had a great reputation for courage, daring and feats of arms. Their power began to wane after the abolition of the feudal system in 1871, which was the turning-point of the Japanese civilization. Their name was changed in 1878 to the more peaceful title of *shizoki.* The last stand of the conservative *samurai* led to the civil war of 1877, which resulted in their defeat and the change of name already mentioned. Many of them had loyally accepted the changes in their ancient standing, keenly as these changes were felt.

San An′gelo, Tex., county-seat of Tom Green County, is on Concho River. Livestock and agricultural interests are combined in the surrounding region. It has an altitude of 1,900 feet and an abundant water-supply, being situated near the confluence of five rivers. Among the most important industries of San Angelo are oil mills, brick works, cotton gins, lumber yards, railway shops. The city maintains an excellent system of public schools. There are several private academies here and a Roman Catholic school. San Angelo has several fine churches and imposing business structures and municipal buildings. It is a modern city situated in the midst of extensive ranches. It enjoys a large export trade in grain and farm produce. In 1930 the population was 25,308.

San Antonio (*săn ăn-tō'nĭ-ō*), a leading city of the State of Texas and the seat of Bexar County, is situated on the San Antonio River. It is eighty miles southwest of Austin, the State capital, and within about 100 miles of the geographical center of the State. Three trunk lines, the Southern Pacific; the Missouri Pacific, and the Missouri, Kansas and Texas Railroads serve the city, connecting it with all parts of the State, and southwestern United States. Houston, the nearest large city, is six hours distant by rail and five and a half hours by motor. The entire territory around San Antonio is served by train and motor bus lines, with hard surfaced roads radiating in all directions. The city is laid out on a level plateau on an elevation 660 feet above sea level and covers more than thirty-six square miles.

The river winds through the city, both sides of which are well built, and eighteen bridges span it within the city limits. The streets or plazas are broad and over-arched by fine old trees, and are lined by imposing business structures and fine residences. Bungalow and stucco two-story houses characterize the residential district which is especially attractive because of the beautiful landscaping. The Breckenridge Park, near the head springs of San Antonio River, contains 200 acres. It is maintained in its natural state and contains a rare collection of wild animals and a bathing beach. San Pedro Park is located in the center of the city and has several mineral springs. An Indian village is said to have occupied this site when white men first visited this locality. San Antonio has fifty beautiful parks and playgrounds comprising 940 acres. In the suburbs are two sulphur springs which attract many visitors. The country around the city is very scenic, and with the historical background which dates back more than 200 years, and with the balmy healthful climate during the winter months the city is becoming very popular as a resort and national playground, as well as attracting many tourists.

San Antonio is one of the largest army centers in the United States, as well as the primary training base for all American flyers. Randolph Field, sixteen miles north of the city on Seguin Road, is located here extending over an area of 2,200 acres. Upon its completion the government will have expended $50,000,000 upon its construction. It accommodates 1,000 students and the field personnel includes 5,000 men. The expenditures, up to September, 1931, on the construction of the field, were $8,500,000. This is the government's only primary training center, as Marsh Field, California, and Brooks Field, San Antonio, were transferred here November 2, 1931. Near San Antonio are located Fort Sam Houston, the second largest military post in the United States; Camp Stanley, an artillery practice field, and Camp Normoyle, auto repair shops of the government.

The outstanding structure within the city, which attracts many visitors annually, is the historic Alamo. The ruins of the four Franciscan missions, San José, Conception, San Juan, and Espada are also of great interest and importance. Among the fine modern buildings in the city, which add to its beauty, are San Fernando Cathedral, the Scottish Rites Cathedral, constructed at a cost of $1,000,000, the City Market and Convention Hall, the Public Library, Federal Building, City Hall, many splendid church edifices and several excellent hotels. There are thirty-seven public grade schools, nine Junior high schools and three high schools in the city. Besides the excellent educational system maintained by the city, there are forty private schools. Among them are West Texas Military Academy; St. Louis College; San Antonio Female College; Academy Ursuline, and St. Mary's College. There are 124 churches in San Antonio, the Roman Catholic denomination having the largest membership and Baptists ranking second. The city maintains three municipal auditoriums, including one open air theater.

San Antonio is the commercial and financial center for a large part of southwestern Texas. Livestock, particularly cattle, is the leading item of trade and large quantities of grain, cotton, mohair, wool, and hides are shipped annually. According to the 1930 United States census there were 412 factories in San Antonio producing goods valued at $60,315,519. A great variety of merchandise is manufactured, including textile fabrics, garments, boots, shoes and leather goods, flour, numerous food and household supplies, candies, soap, brooms, packing house products, foundry and machine shop products and oil field necessities, railroad and government shop work, batteries, carbonic oxygen and acetylene gas, refrigerators and fixtures, asphalt products, cement, glass bottles, concrete, clay and lumber products, and other building materials. Other important manufactures include paint, petroleum products, edible and inedible vegetable oils, pharmaceuticals, and packing boxes.

San Antonio is governed by the commission form of government, the power being vested in the Mayor and four commissioners. The first fort to be built in San Antonio dates back to 1689 when Captain Ramond was believed to have visited this region and established a Spanish hold on this territory. However, the first permanent settlement was in 1718, when the mission of San Antonio de Valero and the Presidio of San Antonio de Bexar were founded by Spaniards from interior Mexico. A small colony from the Canary Islands settled here a few years later. The Alamo, the "cradle of Texas history" dates back to this time, as it was built by the Franciscan Fathers for a mission in 1722. In 1836, more than a century later, a small garrison of Americans under the command of Colonel Travis and James Bowie withstood an attack for eleven days by the Mexican army under Santa Anna. The entire force was finally wiped out.

Seven flags have waved over San Antonio including Spanish, French, Mexican, Mexican Charter, Texan, Confederate and United States. While Texas was a Mexican province San Antonio was the capital, and during the Mexican War with the United States eight battles were fought here. During the Civil War, the city was the headquarters for one of the divisions of the Confederate Army, and also the base for supplies of the United States when troops were sent to the Mexican Border in 1914 and 1915. Since 1878 when the first railroad was extended to San Antonio, the city has grown rapidly and developed into a large industrial and trade center of Texas and the third largest city of the State. In 1930 the population was 231,542. The suburban population numbered 23,020.

San Bernardino, a city and the seat of San Bernardino County, California, is situated in the orange region, sixty miles east of Los Angeles. It is a summer and winter health-resort, because of its uniform climate. The surrounding country is a rich agricultural and mining section. The chief metals in the vicinity are gold, silver, copper and iron. San Bernardino's leading industries are grain-elevators, fruit-crate factories, lumber-mills and the Santa Fe railroad shops. It is also an important shipping point for fruit, grain and lumber. The city has excellent public and parochial schools, a business college, an academy, an orphan asylum and the Southern California Hospital for the Insane. It has electric car service, two railroads and modern improvements. The city stands on the site of an abandoned mission, also named San Bernardino. It was founded in 1851 by Mormons.

San Diego (*săn dē-ā'gō*), a city and seaport of the State of California, and the seat of San Diego County, is situated 132 miles southeast of Los Angeles and fifteen miles north of the Mexican border. The bay extends for a distance of ten miles, and the business section lies along the water front. Balboa Park, the site of the Panama-California Exposition in 1915 occupies an area of 1,400 acres in the center of the city. This park separates the business district from the residential sections, with Fifth Street and Broadway, the principal streets or main arteries of the city. The City Hall and the Federal Building are erected on the Plaza, a noteworthy square laid out in 1909. San Diego is the home of many retired wealthy easterners.

The city is the first port of entry for trade with the Orient as well as the first port north of the Panama Canal. By the Canal, San Diego is nearer to Chicago and the East than any other Pacific port. It ranks second to San Francisco in size and importance of its harbor, which is completely landlocked, free of current, and accessible for all types of vessels in every kind of weather. The harbor occupies an area of twenty-two square miles and a depth of thirty-six to sixty feet. It is a port of call for a number of steamship lines. The city also has excellent transportation facilities, as it is the terminus of two of the transcontinental railroads, the Southern Pacific, and the Atchison, Topeka and Santa Fe Lines. San Diego lies within three hours distance by train to the nearest large city, about four hours by automobile, and an hour's distance by plane. There are five landing fields within the environs of the city.

Due to its mild, sunny climate, San Diego has become a famous health resort city. Coronado Beach, situated across the Bay with its beautiful Hotel del Coronado, tent city, Japanese garden, and botanical gardens, attracts many tourists to San Diego. Among the most outstanding buildings are the First National Bank Building; the Elks' Temple; the Masonic Temple; the Young Men's Christian Association; Saint Joseph's Sanitarium; the United States Grand and San Diego Hotels, and the Public Library. There are thirty-two public grade schools, one Junior high school and four high schools in the city. There are also three parochial schools. In 1931-32 there were 33,500 pupils enrolled in the city schools. The State Normal School is located here, and there are several private schools. There are about 200 fine churches of the many denominations located throughout the city.

The United States Navy and War Departments occupy separate large tracts of land on the bay, utilized for a coaling station and fortifications. Fort Rosecrans is located on Point Loma. This is the home base of torpedo destroyers of the Pacific Coast. A Naval Training Station is also situated here. Other naval projects located in San Diego are Marine Brigade Post, the United States Naval Stores, and a Naval Air Station. The Government investment amounts to over $40,000,000 for all the projects and maintenance of them, with a naval payroll of more than $18,000,000 a year.

The principal industries of San Diego are fish canneries, shipbuilding, aviation, and exporting. There are 29,438,367 pounds of tuna fish packed annually in San Diego's canneries. There are lumber, flour and grist mills, slaughtering and meat packing houses, printing and publishing houses, and brick and tile plants, operating in San Diego. There were 315 manufacturing establishments in 1931 with a total value of production amounting to $63,000,000. The city is a market for the surrounding country where great quantities of fruit, grain, and cotton are grown. The principal exports include lemons, olives, olive oil, raisins, dried fruits, honey, cotton, hides and wool.

In 1930 the population of San Diego was 147,995. Eighty per cent of the inhabitants are native whites; eleven per cent are foreign born. Two per cent of the population are Negroes. The city grew rapidly in the decade between 1920 and 1930, showing an increase of 73,312 in its population.

The city has a modified form of the city manager plan of government, with the power vested in a Mayor, five councilmen, city manager and commissions.

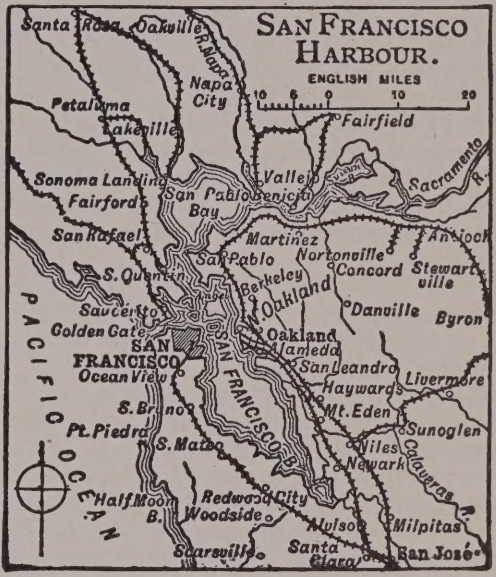
San Diego is the oldest city in California, and Father Junipero's Jesuit Mission of 1768 is still preserved and used. A few miles distant, at the mouth of a cañon, stands the famous Sweetwater dam, one of the largest in the world, with a curving wall of masonry ninety feet high and forty-six feet through at the base. The pueblo of San Diego was taken in 1846 by Commodore Stockton for the United States. Here a fort was erected and named Fort Stockton. This fort still carries the name and is a point of interest to outsiders and tourists.

San Domingo. See HAITI and SANTO DOMINGO.

San Francisco, the chief city of California and the principal port of the Pacific Coast, co-extensive with the county of San Francisco, is situated at the northern extremity of the peninsula between the Pacific Ocean and San Francisco Bay. The peninsula of San Francisco is forty miles long and from five to ten miles wide. The bay stretches north and south for forty-seven miles, and is six to ten miles in width. The entrance to the bay is the Golden Gate, a strait six miles long, and a mile and a quarter wide at its narrowest point. The city occupies a land area of forty-two square miles.

Description. San Francisco is one of the most modern of American cities, as it was built on the ashes of the greatest fire the world has ever seen, a fire which destroyed its entire business and commercial section in April, 1906. The city is one of hills and valleys which present an unusual scenic effect, especially in the residential districts. The shores of the bay are rocky cliffs, 2,000 feet high in some places, and two hills within the city rise to several hundred feet in height. Overlooking the city and harbor from the north shore of the Golden Gate is the peak of Mount Tamalpais, nearly 2,500 feet high, rising abruptly from the bay and sloping gradually westward. There are three islands within the city: Goat or Yerba Buena Island, Alcatraz Island and Angel Island.

Market Street extends from Twin Peaks to the Bay and is 120 feet wide. The principal business establishments are located along this thoroughfare, which extends from northeast to southwest. On the north side of the city are three high hills, conspicuous in the landscape and famed in local history, known as Telegraph Hill, Nob Hill and Russian Hill. Nob Hill was the home of the early California millionaires, and is now chiefly occupied by clubs and apartments. The hills along the north side slope almost to the water's edge and are very attractive as sites for apartments, which cover the section east of Van Ness Avenue. This avenue was the western boundary of the great fire, and has since become "Automobile Row." From Van Ness to the Presidio on the north slope are the homes of the wealthy, and still farther west, almost on the sands of the ocean, are the lovely, less pretentious homes in the districts of Jordan Park, West Clay, Sea Cliff, Lincoln Manor and the Richmond District. Twin Peaks Tunnel made accessible a district of unsurpassed natural attractions on the Peninsula, and communities of homes grew up at once. Pacific Heights is also a popular and fashionable residential section.


SAN FRANCISCO HARBOUR.
ENGLISH MILES
10
5
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10
20
Santa Rosa
Oakville
R. Napa
Napa City
Petaluma
Lakeville
Fairfield
Sonoma Landing
Fairford
San Pablo Bay
Vallejo
Benicia
Sacramento R.
San Rafael
Martinez
Antioch
San Pablo
Nortonville
Concord
Stewartville
S. Quentin
Berkeley
N. Oakland
Angel
Saucelito
Danville
Byron
Golden Gate
SAN FRANCISCO
Oakland
Alameda
Ocean View
San Leandro
Livermore
Haywards
SAN FRANCISCO B.
S. Bruno
Mt. Eden
Pt. Piedra
Sunoglen
S. Mateo
Niles
Newark
Calaveras R.
PACIFIC OCEAN
Half Moon B.
Redwood City
Woodside
Alviso
Milpitas
Searsville
Santa Clara
San José

The Chinese quarter of San Francisco, destroyed in the fire of 1906 and rebuilt along more modern lines, is the most famous in the United States, and is important commercially, in addition to being very picturesque. The streets slope sharply to its boundaries, which are Stockton, California, Kearny and Pacific Streets. No white persons dwell within it. The so-called Latin quarter is situated at the base of Telegraph Hill. The Japanese section is bounded by Octavia, Fillmore, Geary and Sutter Streets. Tar Flat, formerly a district of tenements, is now a business and manufacturing center.

The parks of San Francisco number more than fifty. Golden Gate Park is the largest, extending four miles in length and containing 1,013 acres. A panhandle addition stretches eastward. Formerly this section was sandy and barren, but it is now reclaimed into groves and lawns of utter beauty. The plants and flowers are semitropical. Artificial lakes, a botanical garden and museum, Japanese tea gardens and a children's playground adorn this wonderland, through which a broad speedway extends to the beach of the Pacific Ocean, terminating in a great esplanade. Situated below the famous Cliff House are the Sutro Baths, one of the noted large bathing establishments of the world. Seal Rocks and Sutro Heights are popular resorts on Point Lobos. A thirty-acre stadium contains an auditorium with a seating capacity of 100,000. Another feature of this park is Amundsen's sloop *Gjoa,* which was presented to the city in 1909. Sutro Park is one of the finest private parks in the United States, opened daily for public use. Lafayette and Jefferson Squares are attractive parks in the midst of residence sections of the city. Between Chinatown and Kearny Street is an attractive park, in which is the handsome golden Galleon Monument erected to the memory of Robert Louis Stevenson. In the center of Union Square stands the Dewey Monument. Other important monuments in San Francisco are the Lick Monument in Marshall Square; the McKinley Monument at the entrance to the panhandle at Golden Gate Park; the Soldiers' Monument on Van Ness Avenue; the Native Sons' Monument, and the Lone Mountain Cross at the summit of Lone Mountain.

Harbor. The harbor of San Francisco is one of the largest and finest landlocked harbors in the world. It is sixty-five miles long and has an average width of eight miles. Its shore line, exclusive of navigable inlets, is 100 miles in length. The harbor covers an area of 420 square miles. This harbor in the great bay is protected from storms in all directions. Great ocean liners enter through the Golden Gate. Wharves and warehouses line the shores on the eastern side of the peninsula. This harbor is navigable by the largest ships in all tides and seasons. It is very beautiful, situated in these rocky hills, looking to the Golden Gate and the western skies.

Transportation. San Francisco is the principal port of call of over 100 trans-Pacific, coastwise and intercoastal steamship lines. It maintains commutation service by means of its ferry systems. The San Francisco-Oakland bridge, connecting the city with the mainland, was voted upon in 1931, and by 1934 the piers were almost completed. This will be the longest suspension bridge in the world, with a central span of more than 4,000 feet. It will connect the populous East Bay cities with San Francisco, and aid in the development of the North Bay counties, covered with orchards and vineyards, with forests beyond. San Francisco is the western terminus of three transcontinental railways. Two huge airports are located at San Francisco. This city was the first to use cable-roads, which were invented as the easiest method of transit over its steep and hilly streets. There are numerous electric lines also.

Buildings. There are within the city many large and fine buildings of granite, marble, terra cotta, iron and brick. In the financial district are many imposing structures, among which are the Federal Reserve Bank, Standard Oil Building, Alexander Building, Anglo and London Paris Bank, the Bank of Italy, Balfour Building, the San Francisco Stock Exchange and the Pacific Building. At the Civic Center is to be found one of the finest groups of municipal buildings in the United States. The most important of these are the City Hall, the Municipal Auditorium, the public library and the State building. There are many beautiful club houses and hotels. Among the loveliest structures are the churches, chief of which from an architectural standpoint are the Swedenborgian Church, Calvary Presbyterian, First Unitarian, St. Mary's, First Methodist, Temple Emmanuel, the Grace Pro-Cathedral and Trinity Protestant Episcopal. The Mission Dolores, erected in 1778, is interesting from an historical standpoint also.

Among the important buildings are those situated on the Federal sites. North of Golden Gate Park, the Presidio extends over 1,543 acres. This is a United States military reservation and the headquarters of the Ninth Corps Area of the Army. The harbor fortifications watch the approaches with powerful guns. The officers' quarters are picturesquely situated amid gardens and hedgerows, and there is a hospital and barracks for the soldiers. At the very edge of the water stands old Fort Mason, a brick structure now used as a storehouse. Army transport docks are used by ships departing for the Philippines and the Hawaiian Islands. The military disciplinary barracks and a powerful lighthouse were formerly the sole structures on Alcatraz Island, opposite the entrance to the Golden Gate. In 1934 this became a Federal prison. On Yerba Buena or Goat Island, there is a naval training school, and Angel Island is the site of a quarantine station. The chief naval station of the Pacific is situated on Mare Island, which also contains a dry-dock and yards for shipbuilding.

There are many handsome structures in the city devoted to the extension of education, among which are St. Ignatius College; Sacred Heart College; College of the Pacific; the Medical, Dental and Pharmaceutical Schools of the University of California; the Department of Medicine of Leland Stanford Junior University; the College of Physicians and Surgeons, and a State Normal School.

Industry. San Francisco is the financial center of the Far West, and the wholesale distributing point of the Pacific Coast. There are within the city 1,500 branch offices of firms carrying on international trade. In 1930, there were 2,521 industrial plants in the city, with 45,098 employés who earned $66,461,917 and produced goods valued at $475,618,387. The principal industries include printing and publishing, meat-packing, preserving and canning, foundry and machine shop products, shipbuilding, tanning, and the manufacture of furniture, boots and shoes, flour, coffee, glass, tobacco, lumber, bags, tinware, clothing, chemicals, sugar, leather, metal work, jewelry and marble and stone work. The cleaning and polishing of rice, and oil refining are also important industries. San Francisco is an important city for international trade. The chief imports are coal, timber, rice, sugar, tea and coffee; the chief exports are gold, silver, wine, fruit, wool, oil, flour, lumber and breadstuffs.

Population. According to the census of 1930, the population of San Francisco was 634,934. Of this total, 69.6 per cent are native whites; 0.6 per cent Negro; 24.2 per cent foreign born whites; 5.6 per cent Oriental, and eighty-eight per cent English reading. The population of the metropolitan area in 1930 was 1,578,009.

Government. The city and county of San Francisco are co-extensive, and governed by a Mayor and a board of eighteen elected supervisors. The charter provides for the initiative and referendum, and recall, which gives the people a direct voice in the government. A scheme was promoted for a number of years to consolidate San Francisco with Oakland, Richmond, Alameda, Berkeley, San Mateo County and part of Marin county. This has not been consummated, although since the adoption of the San Francisco Program in 1921 much has been done through closer association and co-operation to more nearly unify the community life of the smaller cities in the entire Bay district with that of San Francisco.

History. On October 9, 1776, two Franciscan monks, Palou and Cambon, established an Indian mission on the peninsula, named San Francisco de Assissi, or the Mission Dolores. The mission became wealthy, and controlled 1,800 Indians in 1825. In 1834 it was relinquished to the civil officers, and a few years after, only the adobe buildings were left. In its place the Spanish established the village of Yerba Buena, the first house of which was erected in 1835. In 1846, an American man-of-war took the town, and the next year its name was changed to San Francisco. The population numbered 450 in 1847. Gold was discovered in 1848, and by September, 1849, there were more than 10,000 inhabitants. This new city was constructed chiefly of wood, with many flimsy structures, and five great fires swept it in 1849-50, although its growth was not retarded by these disasters. In a single year, in addition to immigrants who came to the Golden Gate in prairie schooners from the east, 500 shiploads of adventurers came around the Horn to mine the precious metal. People began to build structures of brick and iron. The poor government and consequent crime and vice which prevailed in the mushroom community caused the organization of a Vigilante Committee to maintain order. They inflicted punishment outside the law, and hanged a number of criminals with salutary effect on the remainder of the community. The population was returned as 42,000 at the close of 1852. In 1869 the transcontinental railway connection was completed. On April 18, 1906, San Francisco was visited by a severe earthquake shock, followed by a great fire which lasted three days, destroying the entire business section and much of the residence section also. As a result of the fire 453 squares were left a twisted mass of ruins. Relief in money, food and clothing poured into the stricken city from all over the world, which marvelled at the courage and enterprise of San Francisco. Rebuilding began with such promptness that within a few years the town had been redesigned and rebuilt on a modern plan, so that it ranks at present as one of the best-planned cities in the world. In 1915 the Panama-Pacific International Exposition was held at San Francisco, in commemoration of the four-hundredth anniversary of the discovery of the Pacific Ocean. The site of this temporary Exposition was an area of 625 acres just inside the Golden Gate. The first shovelful of earth was turned by President Taft on October 14, 1911, and the buildings erected for a distance of two miles along the water front. In 1921 the San Francisco Program was inaugurated. It included extensive improvements in almost every line of city development. In 1914 the great Hetch Hetchy valley project was begun, with the securing of rights to water from 459 square miles of watershed in the northern Yosemite National Park. The plan grew through the years. In 1934, on October 28, a "water party" was held, which celebrated the inauguration of the city's new water supply. This project included the construction of the gigantic O'Shaughnessy dam in the Yosemite, which formed the Hetch Hetchy reservoir having a capacity of 67,000,000,000 gallons of water. Many lesser dams and reservoirs, sixty-four miles of tunnels, innumerable pipe lines and transmission lines, and a number of power houses are also a part of the project. A grant of $3,500,000 from PWA was made to bring the height of the O'Shaughnessy dam to 430 feet and increase the reservoir capacity to 117,000,000,000 gallons, which will not be needed for fifty or seventy-five years. In return for the original grant, the inhabitants of San Francisco paid certain sums of money and built a $300,000 motor highway in the Yosemite. The city owns the dams, and the revenue from the water power had reached an annual total of $2,000,000 by 1934.

San Jacinto (*săn jȧ-sĭn'tō*), **Battle of,** the final battle of the Texan War for independence, was fought on April 21, 1836, near San Jacinto, Texas. General Santa Anna, in command of the Mexican force of 1,400, was attempting to cut off the retreat of the Texans, and met them at the mouth of the San Jacinto river. General Sam Houston ordered his small force of 800 men to charge, which they did to the shout of "Remember the Alamo!" After fighting for an hour and losing 630 men, the Mexicans surrendered. This decisive battle ended the war.

San José (*săn hô-sâ'*), the chief city and the seat of Santa Clara County, California, is situated on the Guadalupe and Coyote rivers, forty-seven miles southeast of San Francisco. It is seven miles from San Francisco Bay, where Port San José is located. It is on the main line of the Southern Pacific railway, and is served by two commercial airports. San José is surrounded by the picturesque Santa Clara Valley, where fruits are grown in profusion, especially prunes, peaches, grapes, plums, olives, apricots and cherries. Wheat and barley are also grown in this fertile valley. The city of San José is beautifully laid out, with wide streets, and beautiful parks and gardens. In addition, Alum Rock Park is situated about seven miles distant, and connected with the city by boulevard and railway. It contains mineral springs that are much frequented, and, with the healthful, dry climate, have aided the city to become nationally famous as a health resort. Among the outstanding public buildings are the City Hall, Court House, Hall of Justice, Hall of Records, Post Office, and the High School. San José is the seat of the University of the Pacific, the College of Notre Dame, a State Teachers' College, a State Normal School and a Polytechnic School. The city is chiefly residential, and is noted for its many bungalows. The country is peculiarly adapted to this type of architecture, and, with the exception of 100 apartment houses, the homes are bungalows, built for one or two families.

The productive locality of which San José is almost the exclusive trading center, has resulted in considerable industry, centering chiefly in fruits and vegetables. There are twenty-one fruit canneries and fifteen packing houses in the city, which is the central city of Santa Clara Valley, where are produced annually 150,000,000 pounds of prunes, and 475,000 tons of fruits, nuts and vegetables. San José produces one-third of the dried prunes of the world. The manufacturing establishments include foundries; woolen and flour mills; granite and marble works; leather; windmills; can, box and basket factories; spray pumps; orchard and fruit-handling machinery, and cannery equipment.

San José was founded by the Spanish. In 1777, the pueblo of San José de Guadalupe and the famous Santa Clara Mission were both established. In 1846 a United States force took possession of San José. The city was the capital of the State from 1849 to 1851. A severe earthquake in 1906 cost many lives and much loss of property. The city is ruled by the City Manager form of government. In 1930 the population was 57,651, of which eighty per cent was native white, and twenty per cent foreign born.

San José, a city and the capital of Costa Rica, is situated in a rich plain, 3,711 feet above the sea, and fifteen miles northwest of Cartago. There are many squares and two large parks. The notable buildings are the presidential and national palaces, the palace of justice, the cathedral, the bishop's palace, the old university buildings, two colleges and the covered market. The chief factory is the government distillery. There are also flour-mills and foundries in San José. It is an important trade center, dealing chiefly in coffee. A railroad joins the capital to Limon, the Atlantic port. San José was founded in 1738, and became the capital of the Republic in 1823. The population in 1932 was 55,857, and 65,905 including the suburbs.

San Luis Potosi (*sän loo-ēs' pō-tô-sē'*), a city and the capital of the Mexican state of the same name, is situated on the edge of a table-land, 7,400 feet above the sea. It is 362 miles northwest of Mexico City. It is well-built, and contains a fine cathedral, a seminary, the Church of San Pedro, the governor's palace and palace of justice. The industries are centered in railroad workshops, a cotton-factory, and very large smelting works. There is an extensive trade in cattle, hides and tallow. There are silver mines near by. The city was founded in 1586, and in 1863 was the seat of the government of Juarez. The city had a population of 73,205 in 1930. The state of San Luis Potosi, which extends over an area of 24,004 miles, had a population of 559,106, in that same year.

San Marino (*mä-rē'nō*), the smallest independent state in Europe and a republic of Italy, is situated among the Apennines, near the Adriatic Coast, twelve miles southwest of Rimini. It extends over an area of only thirty-eight square miles, and contains a few villages besides the town of San Marino. The town, which is built on a mountain crag, can be reached only by one road. Farming and cattle-breeding are the main occupations. Cattle, wine and building-stone are exported. San Marino claims to be Europe's oldest state. Its independence was recognized by the Pope in 1631, when the duchy of Urbino, a part of which it had been since the thirteenth century, was annexed to the papal states. It is governed by a grand council, the members of which are chosen for life, and one-third of whom are nobles. Two captains-general are chosen, each holding office for six months. These governing laws date from the middle ages. In the World War, the republic joined the Allies in 1914. The population in 1932 was 13,948.

San Salvador (*säl-vȧ-dōr'*), a city and the capital of the Central American Republic of Salvador, is situated at the foot of the extinct volcano of San Salvador, which rises to a height of 8,360 feet. The houses are mostly of one story, with thick walls for safety in earthquakes. The government buildings are handsome, and there are also a beautiful cathedral, a national museum and library, and an observatory and botanical garden. There is a large agricultural trade, especially in tobacco and indigo. The city was founded in 1528 by

Jorge de Alvarado. In 1854 it was a fine, well-built city, with a population of over 25,000, but on the night of April 16 it was wholly destroyed by an earthquake. Violent shocks of earthquake were felt in 1873, 1879 and 1891. The population in 1930 was 95,447.

See Salvador.

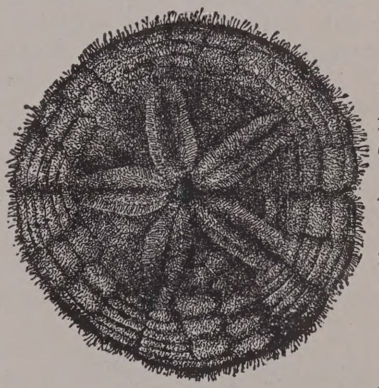
Sancroft (*săn'krŏft*), **William**, a distinguished English prelate and Archbishop of Canterbury, was born in Fressingfield, Suffolk, in 1617. He was a fellow of Emmanuel College, Cambridge, until 1651. In that year he became interested in literary work and devoted the next nine years to the publishing of treatises which severely criticized and censured the creed and discipline of the sectaries. In 1660 he was appointed the chaplain of the Bishop Cosin of Durham. In the following year Sancroft became king's chaplain and rector of Houghton-le-Spring. It was after the Restoration that, in 1662, he became Dean of York, and Dean of St. Paul's (1664). In 1668 he was created Archdeacon of Canterbury. Ten years later Sancroft was made Archbishop of Canterbury. It was he who superintended the reconstruction of the cathedral or more properly Christchurch Cathedral after the devastating fire.

In his capacity as Archbishop, Sancroft attended King Charles II on his deathbed, administering the last rites of the Church. In 1688, clinging to his beliefs as an extreme High Churchman, the Archbishop refused to sit in the Ecclesiastical Commission of James II. Two years later he signed a petition, which is sometimes referred to as the Petition of the Seven Bishops, against the reading of the Declaration of Indulgence, an act which sent Sancroft to the Tower. At the trial which followed in Westminster Hall, however, he and the six other bishops were acquitted of the charge of seditious libel which had been made against them. Sancroft was suspended from his office as Archbishop of Canterbury by Act of Parliament in 1689 because of his refusal to take the oath of allegiance to the new sovereigns, William and Mary. He retired to his native village where, four years later, he died at the age of seventy-six.

Sanctuary (*sănk'tū-ȧ-rĭ*), a consecrated place such as is used for the keeping of sacred things, or the sacred part of any edifice erected for religious purposes, particularly that part in which the altar is placed. When used as a specific term, it refers to the temple at Jerusalem or that retired part of the temple called the "Holy of Holies," in which the ark of the covenant was kept. No person was permitted to enter here except the High Priest, and he was granted this privilege but once a year when interceding for his people. In history, as early as the seventh century, we read of the existence of a practice known as the "privileges of sanctuary" which accorded fugitives and persecuted Jews the right to take refuge in such a holy place. Even in the ancient Greek states criminals were afforded protection in certain temples. These privileges were not extended, however, to persons guilty of the crime of sacrilege or that of treason. In England, several churches had a stone seat at the altar and those persons having fled from persecution or the law would be guarded by its sanctity. The practice of "abjuration of the realm" was also connected with the "privileges of sanctuary." Both of these practices, however, were abolished in England in 1623.

Sand, a term loosely applied to incoherent mineral matter occurring in particles smaller than pebbles and larger than particles of mud or dust. If the mineral matter is fine enough to become mud when wet, it would hardly be called sand. Between clay, the particles of which are very small, and sand, there is no sharp line of demarcation. The one grades into the other. The same is true of sand and gravel. Sand usually consists chiefly of quartz, but it generally contains other mineral matter in small quantities, and sometimes is largely made up of other minerals. Grains of sand are usually thought to be round, although this is rarely the case. They are often roundish, however. As it occurs in nature, quartz-sand is made of partly rounded bits of quartz crystals. These crystals originally occurred in igneous rock, and by the decay of the other minerals of the rock the quartz-crystals were set free. They were then brought together in valleys and along shores by the wash of rain, streams and waves. The purest varieties of quartz-sand are used for the manufacture of glass. Sand is extensively used with lime for mortar and cements. When cemented by natural processes, sand becomes sandstone.

Sand-Dollar, the name given to a flattened sea-urchin, very common on sandy shores. The soft parts are inclosed in a rounded, flattened disc, made of plates of carbonate of lime nicely fitted together. When the animal is living, the discs are covered with short spines. They are dark-yellow or whitish if bleached in the sun. There are five rows of plates, with minute holes for the tube-feet as in other sea-urchins, and five rows without holes. In certain forms the disc is completely perforated by a number of orifices of a keyhole pattern. The larger species of the sand-dollar without perforations are called sea worms. The most common species of the Eastern United States are found in great abundance on the sandy bottoms from New Jersey northward.



Sand-Dollar

See Sea-Urchin.

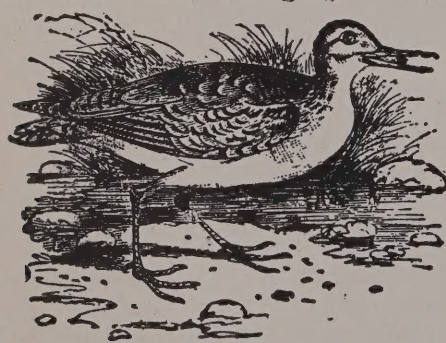
Sand, George, a novelist, whose real name was Armandine Lucile Aurore Dupin, was born at Paris, July 5, 1804. She was educated at a convent in Paris, and at 18 married M. Dudevant. After nine years of married life at Nohant she separated from her husband and went to Paris to make her living by writing. Her life was spent among authors and literary people generally, her most intimate friends being Alfred de Musset (*q. v.*), Chopin, Lamennais and Michel. After 20 years of this life she settled on her estate of Nohant in Berri, dividing her time between writing, at which she was very industrious, and showing hospitality to almost all French and many foreign men of letters of eminence. George Sand wrote an enormous number of novels. Among the best are *Consuelo*, *Mauprat*, *Little Fadette* and *The Marquis of Villemer*. Her plays did not gain the extraordinary popularity of her novels. Her *History of My Life* is interesting, but is mostly made up of her fancies and thoughts. George Sand died on June 7, 1876. See *Life* by Miss Bertha Thomas, in the Eminent Women Series.

San'dalwood, the wood of *Santalum album*, a small genus of trees and shrubs from the East Indies, Australia and the Pacific islands. The wood is white or yellowish and noted for its extreme fragrance. It is costly, and is employed for fans, boxes and other small ornamental articles, these usually being intricately carved.

Sand'blast. See Glass.

San'derling, a bird of the snipe family, which is widely scattered, breeding in Arctic regions and ranging from Iceland to Patagonia. It is about eight inches long and very fat. The winter plumage is ash-gray; the under parts are all white; and in summer the upper feathers are reddish with black markings. They are very common along our beaches, always seen in flocks, always zealously hunting for food. They appear more wary than the sandpiper, utter a shrill cry when startled, and a large company moves as one bird.

Sand'piper, a name commonly applied to several shore-birds belonging to the snipe family. These birds run over the sand uttering a piping note, which doubtless gave them their name. They are small, active birds, running along the shore and feeding on the small forms of life cast up by the waves. Many of them are simply migrants in most parts of the United States. The best-known form nesting in the United States is the spotted sandpiper. This is a true snipe, about seven and one half inches long, with upper parts brownish, gray, and black, the under parts white, spotted with black. It is also called tip-up and pee-wit, being named from its teetering habit and its sharp, sweet *peet-weet, weet-weet*. It is a familiar summer resident, widely distributed, found on high upland as well as wet meadow. The bit of a bird yields only a morsel of food, but many are shot annually by the pot-hunter. Usually there are two broods a season. The nest is made in a depression in the ground, and has a lining of grass; the eggs are buff, speckled with brown. The semipalmated sandpiper or sand-peep is about an inch shorter than the form just described. It is similar in coloring, but has no spots on the breast. They are abundant during migrations in flocks, which sometimes number several hundred. See Snipe.



SANDPIPER

Sand'stone is a rock formed of compacted sand. The grains are generally quartz, though other minerals are often mixed with this; they are colorless or of a dull-white, yellow, brown, red or green. The grains vary in size, forming a fine or coarse grained stone. Sandstone, especially when of handsome color, is much used in building.

Sandus'ky, O., stands on the southern shore of Sandusky Bay, an arm of Lake Erie, 56 miles (by water) west of Cleveland. The bay, 15 miles long and five wide, forms a good harbor. The city is built on a bed of limestone, on a site rising gradually from the shore. Its business as a port is large, its wharves shipping quantities of fish, lime, limestone, lumber, salt, coal, ice, wool, wheat, flour and Ohio wine. There also are machine and car works, edge-tool, wheel, window-glass, furniture, and woodwork factories, wagon and carriage works, corrugated paper and underwear factories, electric-dynamo, steam-turbine, structural iron and cement works. Sandusky is an important import and export point for Canadian trade. It has good municipal buildings, many churches, fine public and parochial schools and a public library. Here is the State Soldiers' and Sailors' Home, which has 37 buildings constructed of blue limestone and accommodates 1,600 persons. The neighboring islands are a favorite summer resort. Population 30,000.

Sand'wich Islands. See Hawaiian Islands.

San'dy Hook, a narrow, sandy peninsula of New Jersey, between the Atlantic and Sandy Hook Bay, 16 miles south of New York. It is about six miles long and reaches northward toward the Lower Bay of New York. Near the north point are a fort, a life-saving station and Sandy Hook lighthouse, with a lantern 90 feet high. The voyage across the Atlantic is considered to begin at Sandy Hook.

Sangir (*säng-gēr′*) **Islands,** 50 mountainous and volcanic islands between the Philippines and Celebes, covering 323 square miles. The largest, Great Sangir, on which a fourth of the people live, contains the volcano Abu, the eruption of which in 1856 cost more than 6,000 lives. The people, who number 50,000, are Malays, and are ruled by their own chiefs under the protection of the Dutch.

San′hedrim, the supreme national council of the Jews, established under the Maccabees. There were 71 members, and it was presided over by the *Nasi* or prince at whose side stood the *Ab-Beth-Din* or father of the council. The members were priests; elders, by whom were meant heads of families; scribes or doctors of the law; and men of learning. The high priest, if a man of learning, otherwise "he who excels all others in wisdom," was appointed president. This court had power over life and death, regulated admission into the priesthood, and slowly gathered to itself the whole internal government of Palestine. It usually met daily in a hall in one of the temple-courts, though on extraordinary occasions it met at the house of the high priest. After the destruction of Jerusalem the sanhedrim found its way to Babylon. See Schürer's *History of the Jewish People in the Time of Christ.*

San′itary Commis′sion, The, was established by women of the northern states at the beginning of the Civil War, to aid and comfort the soldiers of the Union. Its inspectors endeavored to improve the ventilation, drainage, clothing, cookery etc. in the camps. To it was due the establishment of pavilion-hospitals at the camps and of soldiers' homes at recruiting points; it provided hospital-steamers and cars for sick soldiers, and distributed the supplies given the soldiers by the women of the land. The commission was a board of 25 men; its president was Dr. Henry Bellows of New York. During the war $4,924,481 were received, besides supplies worth $15,000,000.

Sansculotte (*sănz′kŭ-lŏt′*), that is, "without breeches," was the name given in scorn at the beginning of the French Revolution by the court-party to the democratic party in Paris. The latter adopted the name with pride, and used it as a title to distinguish the "good patriot." The name was given because of the revolutionists giving up knee-breeches and wearing trousers, not because of their roughness of manner or raggedness of dress, as has often been supposed.

San′ta A′na, Cal., a city 30 miles southeast of Los Angeles, is the county-seat of Orange County and the business-center of Santa Ana Valley. This valley is one of California's most fertile sections, producing fruits of every variety, sugar-beets and wheat and having peat-beds nearby. Santa Ana has flour and planing mills, soda-works and a vegetable and fruit cannery. It has excellent public schools, a business college and a library. It has the service of two railroads, waterworks and a population of 15,000.

Santa An′na, Antonio Lopez de, president of Mexico, was born at Jalapa, Feb. 21, 1795. When 15 he entered the Spanish army, and served against his countrymen till 1821 when he joined Iturbide, who made him brigadier-general and governor of Vera Cruz. In 1822 Santa Anna proclaimed a republic and brought about the downfall of Emperor Iturbide. In 1829 he defeated and captured a body of Spanish troops which had landed at Tampico, and in 1832 through intrigue and revolt had himself chosen president. Under Santa Anna the states became mere provinces, while all power was in the hands of the central government. This policy cost Texas in 1836. Santa Anna invaded this province with 6,000 men, and defeated and massacred the Texans with unbroken success, till he was routed and his army and himself taken prisoners by Gen. Sam Houston at San Jacinto (*q. v.*). After eight months' imprisonment he was set free, but his influence at home was not recovered till his gallant defense of Vera Cruz against an attack of the French in 1838. In 1841 a revolution again put him in the president's chair, and in 1845 another revolution sent him into exile at Havana. But in 1846 the war with the United States, which had opened badly with the loss of Palo Alto, Resaca and Monterey, caused the Mexicans to recall Santa Anna and make him president and commander-in-chief. But the loss of the battle of Buena Vista to Taylor and Cerro Gordo to Scott, followed by the certainty of the fall of the capital, induced Santa Anna to leave the city by night, after resigning the presidency. In 1853 he was made president for life, but his harsh rule caused him to be driven from the country two years after. In 1867, after the death of Maximilian, he tried to land in Mexico, was captured, tried and condemned to death, but was pardoned on condition of leaving the country. He died at Mexico City, June 20, 1876.

Santa Bar′bara, Cal., county seat of Santa Barbara County, 104 miles northwest of Los Angeles, on the Santa Barbara Channel. The surrounding country produces fruit, English walnuts, olives, beans, corn, potatoes, etc. Petroleum and valuable medicinal springs are near the city which has a good harbor and fine railroad connections. Santa Barbara has good public schools and the only State Normal School where teachers are trained in domestic science. The Santa Barbara Mission, the largest and best-preserved of any in California, and the only one in which services have been held continuously since the founding in 1786, is here. Population, 25,000.

Santa Claus, a corruption of the name of St. Nicholas. The term was first used by the Dutch settlers of New York, who kept a San Claus holiday. Santa Claus is held to be the patron saint of the young, and his feast, held on Dec. 6, was celebrated formerly in England and still is in Germany. Now the visit of Santa Claus bearing gifts to the children is transferred to Christmas.

Santa Cruz', Cal., a prosperous city of Santa Clara County, 60 miles south of San Francisco on the Bay of Monterey. It is in a fruit-belt, but also engages in manufacturing. Chief among its productions are powder, soap, boxes, bitumen, leather and lead. The city has excellent public and parochial schools, a business college and a public library. It has the service of two railroads, a fine bathing-beach and good public buildings. Population 11,146.

Santa Fe (*săn'ta-fā'*), **N. M.,** the capital of New Mexico, is among the Rocky Mountains, 6,840 feet above the sea and 1,327 miles southwest of Chicago. The site is a mountain-walled basin, 20 miles from the Rio Grande. Half the people are Mexicans, dwelling in low adobe houses on narrow streets. The plaza has shops on three sides, and on the other the old governor's palace, a long, low, adobe building. The climate is so dry that irrigation is necessary for gardening or farming. When first seen by the Spaniards about 1542, the town was a well-peopled Indian pueblo. It was founded in 1605, and has been the capital since 1640. The Indians captured it, burned the main buildings, and drove out the whites in 1680. The Indians again made an attack in 1837, but were driven off by the Mexican governor, Manuel Armijo. General Kearny occupied it with United States troops in 1846. During the Civil War the Confederates held Santa Fé for a few weeks in the spring of 1862. Santa Fé has three public-school buildings, fine churches, a U. S. Indian school, a deaf and dumb school and the penitentiary. The city has a fine waterworks and electric light system. Its points of interest are many and historical, as the church of San Miguel, the oldest church in the United States, and the governor's palace built in 1598. Population 10,000.

Santa Ro'sa, Cal., county-seat of Sonoma County, about sixty miles northwest of San Francisco. It is in a fertile section, where, in addition to fruit-growing, hops are a crop, and stock-raising and dairying are practiced. Its industries include soap-factories, flour-mills, fruit-drying and canning works. It is the home of Luther Burbank, the "plant wizard" (*q. v.*). Santa Rosa is served by the California Northwestern and Southern Pacific railroads.

Population 10,000.

Santiago (*sän'tē-ä'gō*), the capital of Chile, stands on a wide and beautiful plain near the western base of the Andes, 1,700 feet above the sea-level and 115 miles southeast of Valparaiso. The town is well-built, but most of the houses are only one story high, owing to earthquakes. The chief square is Plaza Independencia, its sides formed by the government palaces, arcades, cathedral, archbishop's palace and a handsome hotel. On the site of the Jesuit Church, which was burned down in 1853, is a marble and bronze monument in memory of the 2,000 worshipers, mostly women, who perished in the fire. The government buildings include the capitol, mint, president's dwelling, prison, two hospitals and a deaf and dumb asylum. The Alameda, with four rows of fine poplars, runs the whole length of the city and is adorned with many statues. Facing it are the State University with 2,500 and the National Institute with 2,148 students. There are other special schools, besides a national library of 116,300 volumes, botanical and zoological gardens, exposition buildings, theaters and club-houses. Santiago is surrounded by pretty suburbs dotted with villas and gardens bright with flowers. There are considerable trade and a busy stock-exchange. Cloth, ship-biscuits, beer, ice etc are manufactured. Santiago was founded by Pedro de Valdivia in 1541. Population 500,000. See CHILE.

Santiago de Cuba (*sän'tē-ä'gō dā koō'bä*), a southeastern province of Cuba; also a fortified city, seaport and former capital of the island, situated near the mouth of River Santiago, fronting a harbor four miles long on the southern coast. American administration of the city and province was in July 1898, intrusted to Maj.-Gen. Leonard Wood and was ably conducted. He effected many reforms and did much to improve sanitary conditions and secure good and orderly government. He also established public schools, instituted courts of law, and constructed roads inland and along the coast. The region is rich in metals, including iron, copper and manganese, and in forests of cabinet-woods, as mahogany and cedar, besides dye-woods and other elements of wealth. Its chief products, however, are sugar and tobacco; while in the city there are many cigar factories, foundries and saw-mills.

On the outbreak of the Spanish-American war the Spanish fleet under Admiral Cervera was in West Indian waters; on May 20, 1898, this squadron entered the harbo of Santiago and was at once blockaded by United States fleet, commanded by Admiral

Sampson. To "bottle up" the Spanish vessels in the harbor, Lieut. R. P. Hobson took the *Merrimac* into the narrow channel between the Morro forts, at the exit of the harbor, and there sank her with torpedoes. This gallant deed was effected on the night of June 3, and was rendered all the more hazardous, not only by the blowing up of the ship, but by the fire drawn upon her from the enemy. Hobson and his volunteer crew were all made prisoners, two only of their number having been wounded. A few days after this a force of United States marines landed at Caimanera and formed Camp McCalla; General Shafter landed a division at Baiquiri; and General Wheeler another at Siboney, the landing being covered by the guns of the fleet. These forces, proceeding toward Santiago, were met near Sevilla, six miles inland from Baiquiri, by a Spanish force, when the battle of Las Guasimas was fought. Following upon this (July 1st), occurred the two bloody engagements at San Juan and El Caney, in which the Spanish forces were defeated and driven within the fortifications of Santiago Then came the fatal dash of Cervera's squadron out of the harbor, which Hobson had not succeeded in closing, and its speedy annihilation on July 3. Operations against the city were pressed by General Shafter resulting in the surrender, July 14, of the city and province together with over 20,000 Spanish troops under General Toral. Population of the town about 50,000. See SPANISH-AMERICAN WAR and CUBA

San'to Domin'go, The Republic of, was founded in 1844 The present president is Ramon Caceres, the holder of the presidency being elected by an electoral college for four years. The legislative power is vested in a national congress composed of 24 deputies. The area of the republic is estimated at 18 045 square miles with a population of about 610,000, which, unlike that of Haiti, is chiefly composed of a mixed race of the original Spanish inhabitants, the aborigines, mulattoes and negroes, and a considerable number of whites or of inhabitants of European descent, who speak Spanish and, in the towns, both English and French. The capital at the mouth of the Ozama, is Santo Domingo. Santiago is estimated to have 12.000 inhabitants; Macoris 5,000; and Puerto Plata, the chief port, about 6,000. The republic has about 300 public schools, with some 10,000 pupils. The country is rich in timber, as also in minerals. Its chief exports, however, are sugar, cocoa, bananas, coffee and leaf-tobacco; rice is also grown. The imports in 1910 were a little over six million dollars in value; while the exports amounted to $10,849,000. There are about 150 miles of railway and 430 of telegraph line See HAITI. Consult Hazard's *Santo Domingo* and Kimball's *Life in Santo Domingo.*

Santo Domingo, capital of the Dominican Republic, is on the southern coast of Haiti It was founded by Columbus as early as 1494. The main buildings are the Gothic cathedral, where the ashes of Columbus found rest from 1536 to 1796, the hospital, arsenal and government buildings. A wall surrounds the town, and forts and batteries defend the harbor. Population 18,626.

Santos-Dumont (*sän-tōs-dü'mōn'*), **Alberto,** is a balloonist and inventor born in Brazil in 1873, who learned practical mechanics on his father's private railroad at the same time that he attended the school of mines at Minas. He was a student and graduate of the University of Rio Janeiro; and in France entered the aëronautic school. In 1807 Santos-Dumont made no less than 20 balloon-ascensions.

Sao San Paulo (*soun pou'loo*), capital of the Brazilian state of the same name, is the seat of the world's coffee industry. It is the richest and most populous state in Brazil, and the handsome city is surrounded by suburbs famous for their beauty. The wealthy interests rebelled in 1924 against the reforms and restrictions which President Arthur Bernardes instituted, but the uprising was subdued. The city is the second largest in Brazil; its population is 800,000. The area of the state is 112,307; the population, 7,000,000.

BRAZIL
SAO PAULO

Sap, Ascent of. See WATER, ASCENT OF.

Sapphire (*săf'īr*), the most precious of gems except the diamond and ruby, is, like the latter, a variety of corundum. The name is commonly given to the beautiful blue variety of corundum, but stones of other shades, as colorless or pink, sometimes receive the name. Purplish or greenish colors are undesirable, while clouds, milky spots, flakes or stripes show flaws. It is found crystallized, usually in six-sided prisms, ending in six-sided pyramids. It is sometimes found imbedded in gneiss, but more often in clay soils. The finest sapphires are found in Ceylon; Kashmir and Burma also produce beautiful specimens; and sapphires are found in the United States (particularly in Montana) and in Victoria and New South Wales. The value depends on quality rather than size and does not increase with the size, as does that of the ruby. A sapphire of 165 carats was sold in 1867 for $40,000. In early times a dark-hued or indigo sapphire was called a male sapphire, a pale blue one a female sapphire.

Sappho (*săf′ô*), one of the great poets of the world, was born on the island of Lesbos in Greece. She was only six when she lost her father, and must have lived about the end of the 7th century B C., as she flourished at the same time as Alcæus and Stesichorus. But little is known of her life, except that she had a daughter and was acquainted with Alcæus. It is said that she fled from Mitylene to Sicily for refuge about 596, but a few years later came back to Mitylene, where she was the center of a group of girls with a passion for poetry. But two of her odes, one to Aphrodite, with a number of short fragments have survived the wear and tear of centuries, but they are enough to assure her genius. For sincerity, deep feeling, passion and exquisite grace her lyrics stand alone. There is a story that she fell in love with a beautiful youth, and, because he did not return her love, plunged from a precipice, called the Leucadian rock, into the sea.

Saprophytes (*săp′rô-fītz*), plants which are not able to make their own food and do not attack living plants or animals, but obtain their food from decaying bodies or organic products. These plants are not able to make their own food, because they do not contain chlorophyll. They attack dead bodies or body products, and sooner or later all organic matter is attacked and decomposed by them. Were it not for them it is said that "the whole surface of the earth would be covered with a thick deposit of the animal and plant remains of the past thousands of years." Saprophytes are mostly fungi, but some of the higher plants also adopt this method of obtaining food. See Fungi.

Sap=Suck′er, a name loosely applied to several small black and white woodpeckers and to the white-bellied nuthatch. The only true sap-sucker is the yellow-bellied woodpecker, a permanent resident in some parts of the United States and a winter resident in other parts. These birds perforate the bark to the sapwood, and have done extensive damage to orchards and shade-trees in the west. But they also render service in that they are great insect-eaters; destroying countless numbers of ants, wasps, beetles, bugs and grasshoppers and eating more flies than any other woodpecker. The bird is about one fifth smaller than the robin; its upper part is black, white and yellowish; breast black and the rest of the under-part pale yellow; throat and crown a bright red. It is a boisterous member of the woodpecker family, its note gay and rollicking, its woodpecking tattoo a spirited performance. Both the male and the female work in making the nest, excavating a deep hole, where five or seven white eggs are well-concealed. Both birds share in hatching.

Sap′wood′. As the trunks of trees increase in diameter each year, new layers of wood are laid down. The ascending sap moves through the newer wood, gradually abandoning the older. This newer wood, therefore, is known as sapwood, in distinction from the abandoned wood, known as the heart-wood (*q. v.*).

Saracen Architecture. There are no examples of purely Arabic architecture, except a few indistinct ruins of cities and streets excavated out of rocks. The Arabs were wanderers, not artists, and so, whether they built at home or in the countries they invaded, Persian and Byzantine workmen were the usual builders secured by the caliphs or rulers. Omar the second caliph (644 A. D.) introduced the minaret, a slender tower from which a priest should call the people to prayer. All of the Arab tribes in Asia, as well as the Moors of North Africa and Spain, are classed under the term Saracen, and it is to this race that Europeans owe some of their best designs used in architecture and the practical arts. Interesting examples of Saracenic architecture are in Cairo, Damascus, Cordova, Seville and Granada. The Saracens are lovers of geometry. Their Mohammedan Bible, the Koran, is written in Cufic, the most beautiful script known. Therefore the artists invented a type of design known as arabesque, which is a combination of scrolls, lines and twists, with which they stamped the upper portion of their plaster-walls, mingled with texts from the Koran. This, combined with a stalactite or hanging ceiling, made a beautiful and refined decoration. The lower portions were faced with richly colored tiles dipped in a glaze (coat of glass), an art learned from the Persians, who taught soft pottery. Wonderful tiles in blues and greens, with copper glaze, may be seen on the tomb of Mahomet (A. D. 707) the great mosque at Cordova (A. D. 756) and the Moorish buildings of Granada. There, also, one may examine a vase about four feet high, of graceful proportions, which is decorated with arabesque and covered with a brilliant gold glaze. This ware is known as Hispano-Moresque. The finest example that is perfect is owned in Sicily. The Saracens introduced tapestry or carpet-weaving into Spain about the 12th century and later established looms in Almeria and Malaga, where the costliest stuffs were woven. These included the material manufactured for the nobility, called *tiraz*, with the name of the wearer to be woven in the cloth. A banner now in Burgos shows a crimson stuff woven and embroidered in gold threads. Strictly Moorish architecture is known by the absence of domes and decoration upon the outside of buildings and by the presence of isolated towers and elaborate adornment of interiors. The most noted of their royal palaces is the Alhambra (*q. v.*). Consult Gwilt's *Encyclopedia of Architecture;* Lübke's *History of Art;* and De Forest's *History of Art.* See ARCHITECTURE and FINE ARTS.

Saracens (*săr'ȧ-sĕnz*), the name formerly given by western writers to the Mohammedans of Syria and Palestine, the Arabs generally or the Arab-Berber races of North Africa, who conquered Spain and Sicily and invaded France. Later it was used to mean all nations against which crusades were preached, and was thus applied to the Seljuks of Iconium, the Turks, the Gypsies and even the pagan Prussians. Whether the word comes from an Arab work meaning to steal, from another meaning desert, from a Hebrew word meaning poor or from an Arab word meaning eastern people has been disputed, but the last guess is the most likely. See ARABIA, CRUSADES, MOORS.

Saragossa (*sä'rȧ-gos'ȧ*) or **Zaragoza,** a city of Spain, formerly capital of the kingdom of Aragon, stands on the Ebro, 212 miles northeast of Madrid. A seven-arched bridge, built in 1437, crosses the Ebro within the city. The low, brick houses and narrow, winding streets contrast strangely with the many tall and slender towers and spires. There are two cathedrals, one a Gothic building of the 13th century. The citadel of Aljaferia once was the palace of the kings of Aragon and later the headquarters of the Inquisition. The university, founded in 1474, has 47 professors, 800 students and a library of 18,000 volumes. The leading tower, *Torre Nueva,* built in 1504, has been declared unsafe and ordered taken down. Cloth, silk and leather are among the town's manufactures. The name is a corruption of *Cæ sarea Augusta,* which it was called in 25 B. C. It was an important Roman town, and was one of the first Spanish cities to accept Christianity. Saragossa was taken by the Goths in the 5th and by the Moors in the 8th century, and recaptured in 1118 by Alphonso of Aragon, after a five years' siege, during which most of the people died of famine. It was twice besieged by the French in 1808, 60,000 people perishing in its defense. It was at this siege that the famous Maid of Saragossa, whose exploit has been sung by Byron and Southey, fought by the side of her artilleryman lover. Population 105,788, of the province 448,198.

Saratoff (*sa-ra'tof*) or **Saratov,** a city of Russia on the Volga, 500 miles southeast of Moscow, stands on terraces rising from the river. There are nearly 30 churches, two cathedrals and a museum containing a fine art-gallery and library. Brandy, liquors, oil, flour and tobacco are manufactured. There is also a large trade. Saratoff was pillaged in 1774 by a Cossack pretender to the czardom. Population 197,822.

Saratoga (*săr'ȧ-tō'gȧ*) **Springs, N. Y.,** one of the chief watering-places in the United States, is 38 miles north of Albany. It has about 50 mineral springs, whose waters are bottled and exported. There is a large number of huge hotels, some having rooms for over 1,000 guests, and on special occasions they have accommodated 40,000. Because of its spacious hotels and convention-halls it is a favorite place for conventions. It has 18 churches, several charitable institutions, good public and parochial schools, a high-school and Temple Grove Seminary, each of these containing a library, and also the libraries of McMillan Reading Circle and the Athenæum. There is a race-track, and regattas are held on Saratoga Lake, four miles away. Population 15,000.

Saratoga, Battle of, was fought on Oct. 7, 1777, near Saratoga Springs, N. Y. The British under Burgoyne and the Americans under Gates had faced each other since Sept. 14. Burgoyne advanced against the Americans, who charged in turn, headed by Arnold, who had rushed without orders to head off the attacking column and had assumed command. After a stubborn fight the British abandoned their guns and retreated to their camp, followed by the Continentals who charged and carried a part of the camp, when darkness ended the battle. On the 9th Burgoyne retreated to Saratoga, where he was hemmed in by Gates and forced to surrender, on the 17th. At the time of the surrender the American force numbered 10,817; the British surrendered 5,804 men, 4,647 muskets and 42 guns. This victory in some respects was the most decisive one of the war. Twelve miles east of Saratoga Springs a handsome obelisk, 155 feet high, on a bluff 350 feet above the Hudson, overlooks the scene of this surrender, which it commemorates.

Sardanapalus (*sär'dȧ-nȧ-pā'lŭs*), according to Greek tradition, a king of Assyria, whose reign was ended by a revolt. The rebels were defeated several times, but at last shut up Sardanapalus in his capital of Nineveh and besieged him for two years. When the city could hold out no longer, the monarch gathered all his vast treasures, and, setting them on fire, leaped with his wives into the flames. It is not certain what, if any, real king of Assyria is referred to under this Greek name He perhaps was Asurbanipal, who began his reign in 668 B.C.

Sar′dine, a small fish of the herring family. It received its name from being taken abundantly off the coast of Sardinia. The true sardine is a tunny. They are abundant in the Mediterranean and off the coasts of Spain and Portugal. They are salted, boiled in oil and packed in flat, tin boxes containing oil. In this form they are exported as a delicacy to all countries. The supply of true sardines is now considerably reduced and is not sufficient to supply the market. As a result, sprats, pilchards and other small herring have been preserved in oil and sold under the name of sardines.

Sardinia (*sär-dĭn′ĭ-ȧ*), an island of Italy, after Sicily the largest in the Mediterranean, is 135 miles southwest of the Tiber and is south of Corsica, from which it is separated by the Strait of Bonifacio, seven and one half miles wide. In the south is the Gulf of Cagliari, a deep, wide bay, and in the north the Gulf of Porto Torres. The island is 170 miles long and 75 wide, and covers 9,306 square miles. The country is generally mountainous, the highest peak being Gennargentu (6,233 feet). The grotto of Neptune on the west coast is one of the finest in Europe. Sardinia in early times was a granary of Rome, and was renowned for its mines. It has a rich soil, valuable mines, large forests and important fisheries, but these resources are only partially used. The main produce is wheat, barley, beans, potatoes, wine, olive-oil, oranges, lemons, tobacco and flax. Large numbers of horses, cattle, sheep, swine and goats are bred. Lead and zinc are the chief metals mined; granite, marble and clay for pottery are quarried; and convicts manufacture salt from seawater. The fisheries yield tunny, sardines, anchovy and coral. There are a number of good ports — Cagliari (the capital), Porto Torres, Terranova, Tortoli and others. The people mostly are mixed races, Spanish and Italian. Italian is spoken by the educated, but the common language is a mixture of Latin, Italian and Spanish. Eighty-three per cent. of the population cannot read or write; there are universities at Cagliari (founded in 1626, with 254 students to-day), and Sassari (founded in 1677, with 200 students). The vendetta and brigandage, once common, have almost wholly stopped. The first people of Sardinia seem to have been Iberians. These were conquered by the Phœnicians, but little is known of them before the conquest by the Carthaginians in 512 B. C., who ruled tyrannically till displaced by the Romans in the 3d century B C. After the fall of the Roman empire Sardinia was overrun by Vandal, Goth, Saracen, Byzantine and papal soldiers. After a twenty years' struggle the Pisans and Genoese drove out the Saracens, and in 1200 divided the island between them. Its later masters were the Aragonese, Spaniards and Austrians, and in 1720 it was exchanged for Sicily and, with Savoy and Piedmont became the kingdom of Sardinia under the rule of the house of Savoy. Except for the short time it was annexed to France under Napoleon, this family continued in power. After the French Revolution Sardinia became of importance among the smaller European states and took part in the Crimean War Victor Emmanuel II became king of united Italy and its later history is Italian. Population 852,934. See C. Edwardes' *Sardinia and the Sardes.*

Sar′dis, the capital of ancient Lydia in Asia Minor, stood at the foot of Mount Tmolus (5,906 feet). Its people were rich. They wove luxurious, woolen stuffs and carpets and carried on a large trade between the highlands and the coast. It, moreover, was the capital of fabulously wealthy Crœsus. Its wealth was tempting; it was destroyed by the Cimmerian Gauls in the 7th century B. C., by the Athenians in the 6th, by Antiochus the Great in 215 B. C. and by Timur in 1402; besides this it was overwhelmed by an earthquake in the reign of Tiberius. Both Xerxes and Cyrus the Great lived here before setting out on their famous expeditions. Sardis lost its trade as Byzantium grew, and now only a small village, called Sart, stands on the ancient site.

Sardonyx (*sär′dō-nĭks*), a variety of onyx or stratified chalcedony, exhibiting white layers alternating with those of a red or brown color. It has always been a favorite stone with the cameo-engraver, and hence the stone has been imitated artificially by spurious fabrications. The sardonyx usually is composed of two strata, a thin layer of white chalcedony resting upon a ground of either carnelian or sard; though more rarely it presents three layers — a superficial stratum of red, an intermediate band of white and a base of dark-brown chalcedony. The stone is to be distinguished from jasper, an opaque variety of chalcedony, and from the Mexican onyx, a form of aragonite or carbonate of lime. The sardonyx derives its name from Sardis, reputed to be its original locality.

Sardou (*sär′dōō*), **Victorien,** French dramatist, was born at Paris, Sept. 7, 1831 His first production was a failure, but in 1860 he met with success in *Monsieur Garat* and *Les prés Saint-Gervais.* Even better received was his comedy *Les Pattes de Mouche*, as were his numberless dramatic compositions for Madame Bernhardt and others — *Fédora, Théodora, La Tosca, Gismonda.* Other of his notable productions are *Nos Intimes, La Famille Benoîton, Divorçons, Belle-Maman, Pamela, Cléopâtra* and *La Marquise.* In 1899 he wrote a play for Henry Irving on the theme of Robespierre, followed by one on Dante. He died on Nov. 8, 1908.

Sargas'sum, a genus of brown seaweeds whose species are often observed floating in great masses in the large eddies formed by oceanic currents. These regions of comparatively stagnant water covered by sea-weeds are known as Sargasso Seas, the prevailing type being a species of *Sargassum.* See PHÆOPHYCEÆ.

Sar'gent, John Singer, an American painter, was born of American parents in Florence, Italy, in 1856. He was educated in Italy, France and Germany. His early art-training was under Carolus Duran by whom he was chosen to assist in the execution of important government commissions wherein he mastered the secrets of French technique. His chief works are in portrait and genre; among the former *Carolus Duran, Joseph Jefferson, William M. Chase, Homer St. Gaudens, President Roosevelt;* among the latter, *Fishing for Oysters at Cancale* and *Neapolitan Children Bathing.* His most ambitious and original works are the decorations in the Boston Library which include the famous *Frieze of the Prophets.* His portraits reflect clearly even the subtilest traits of individuality. His manner is French, and his treatment superior. His *Dogma of the Redemption,* a portion of the wall-painting in the Boston Library, is deeply devotional and one of the finest Christian paintings of the period. It is divided into an upper and lower panel, which seem to represent Heaven and Earth; in the upper are the three persons of the Trinity enthroned, redeeming the world; in the lower are angels bearing the reeds, nails, the spear and crown of thorns.

Sar'gon. See ASSYRIA.

Sarma'tians, a race who spoke the same language as the Scythians. They were nomads, wild and savage in looks, good horsemen and bowmen, and dressed in leather armor. Their young women went into battle on horseback, a custom which may have caused the Greek stories about the Amazons. They were made of several tribes that roamed the wide plains from the Vistula and the Danube to the Volga and the Caucasus. In the second half of the 4th century B. C. they conquered the Scythians (*q. v.*). Their empire lasted till the 4th century A. D., when it was overthrown by the Goths.

Sar'nia, Can., stands where St. Clair River issues from Lake Huron. The submarine tunnel connecting the railway systems of Ontario with those of Michigan is here. Steamers leave Sarnia twice a week for Duluth. There is ferry-communication with Port Huron (Michigan). The oil-refineries, salt-works and lumber are extensive industries.

Sar'saparil'la is the dried root of the smilax, a native plant of Central America. It is a twining shrub, which grows only where water is plenty. The brownish root is many feet long and about as thick as a goose-quill. A liquid extract is used as a flavoring and a medicine.

Sar'to, Andrea del, a painter of Florence, where he was born in 1487 or 1486. His family name was Vannucchi, but he was nicknamed Del Sarto — the tailor's son — from his father's business. He painted two series of frescos in Florence, the best of the first series being *Nativity of the Virgin* and *Journey of the Three Kings.* He spent a year in Paris at the invitation of Francis I, and was very popular among the French. The most celebrated of his single pictures are the *Last Supper,* the *Madonna with the Harpies* and *Fathers of the Church Disputing.* Del Sarto was a rapid worker, and excelled in accurate drawing. Michael Angelo rated him highly. He died at Florence in 1531. See Crowe and Cavalcaselle's *Painting in Italy.*

Saskatche'wan, a province of the Dominion of Canada lying west of Manitoba and having Alberta on the west, Mackenzie on the north and the United States on the south. It has an area of 251,000 square miles. The province is a vast plain, containing 159,038,720 acres, and the greater portion of its southern two thirds is situated in the great wheat-growing belt. The portion adjoining or lying near to Manitoba possesses much of the characteristics of that province as to soil, topography, climate, rainfall and, consequently, productive adaptabilities. The soil is a friable loam, easily worked and producing excellent crops of wheat, coarse grains and vegetables. The winter climate answers all requirements, both as to degree of cold and as to sufficiency of snowfall, for the production of the No. 1, hard wheat for which Western Canada is now noted. The valleys along Saskatchewan, Qu'Appelle, Assiniboine and Souris Rivers, Pipestone, Long and other creeks, are specially adapted for mixed farming, and the open prairie beyond affords large areas for grazing or grain-growing The region is well-served by the Canadian Pacific Railway. Southwestern Saskatchewan is entered at McLean station, and its first considerable town is Regina, the capital of the province. The land here is a rich, fertile loam, as well to the south as to the north. Several new and important towns have sprung into existence along the "Soo" line, as Halbrite, Weyburn, Yellow Grass, Estevan, Milestone and Rouleau. The cultivation of flax is carried on to a considerable extent. Wheat-raising, however, is the important industry of this district, and the yields are highly satisfactory to the producer. Between Regina and Moose Jaw there is splendid land, and mostly occupied by prosperous farmers. The central portion of the province is almost centrally divided by the main Saskatchewan River, which is altogether within the district, and by its principal branch, the North Saskatchewan — most of the navigable length of which lies within its boundaries. It includes, in the south, a small proportion of the great plains, and in its general superficial features may be described as a mixed prairie and wooded region, abounding in water and natural hay and well-suited by climate and soil for the raising of wheat, cattle and sheep. As a general thing, the surface is gently undulating prairie. Northern Saskatchewan consists of the eastern half of the late Territory of Athabasca and embraces an area of about 70,000,000 acres, enough for a fine-sized province in itself. As yet it is not opened for settlement because of its inaccessibility and distance from railway systems, the nearest railway station being Prince Albert. The province had a yield of wheat of 112,369,405 bushels in 1913 and of oats 110,210,436 bushels. The mean summer temperature at Regina is 62.7° and in winter is 6.9°. The population is 900,000. Its capital city, Regina, has a population of 45,000, Moose Jaw has 25,000, Prince Albert 12,300 and Saskaloon 27,500.

Saskatchewan (*săs-kăch'ê-wŏn*), a large river of Canada, draws its waters from the Rocky Mountains, and is formed by two head-waters called the south and the north branch. The northern branch rises among the glaciers near Mt. Hooker, the southern branch from a group of springs near the same locality but a short distance to the south. The former has a course of 770, the latter of 810, miles before they meet. The river then flows east 282 miles to Lake Winnipeg, from which its waters are carried to Hudson Bay by Nelson River. Including the Nelson, its whole length is 1,514 miles. Steamers run from Lake Winnipeg to Edmonton (700 miles); the Nelson is spoiled for navigation by rapids.

Sas'safras, the popular and the technical name of a genus which contains but a single species, native to eastern North America. The trees usually are small, but occasionally become 125 feet in height. The root is largely used for the aromatic oil.

Satellite (*săt'ĕl-līt*), a small planet or moon. The term is generally employed in astronomy to denote one planet revolving about another; and hence satellites are sometimes called *secondary* planets, to distinguish them from the *primary* or larger planets. One of the chief points of interest in connection with satellites is that a satellite enables one to determine the mass of the primary as soon as the radius of its orbit, *r*, and its period, T, are known. For then, if we denote the mass of the primary by M and the mass of the secondary by *m*, we have

$$M+m=\left(\frac{2\pi}{T}\right)^{2} r^{3}$$

and, since *m* is practically always negligible in comparison with M, we have

$$M=\left(\frac{2\pi}{T}\right)^{2} r^{3}$$

For a list of the known satellites see *Webster's Unabridged Dictionary*, article *Solar System*. On the evolution of satellites see *Time and Tide* by Sir Robert Ball in the Romance of Science Series.

Sat'inwood, the wood of *Chloroxylon Swietenia* from India. The wood is deep yellow and remarkably close-grained, heavy and durable.

Satolli (*sȧ-tōl'lē*), Cardinal **Francesco,** a Roman Catholic prelate and diplomat of the papal see, was born at Perugia, Italy, July 21, 1831. In 1888 he was created archbishop of Lepanto, and in the following year represented the pope at Baltimore, Md., on the centenary of the Roman Catholic hierarchy and on the inauguration of the Roman Catholic university at Washington, D. C. In 1893 he came again to America as apostolic delegate with plenary powers, and in 1896 received the cardinal's hat. Cardinal Satolli is the author of a *Course of Philosophy* on the *Summa* of St. Thomas and of essays on various philosophical themes. In 1892 his action in regard to church controversies aroused opposition, but was sustained.

Sat'suma Ware, named from the province of Satsuma in Kiushu, is a fine pottery, almost like porcelain, which in its older examples is much sought. The ware has a yellowish glaze, and is ornamented in red, gold, green and silver. The Japanese excel in this hard pottery, although the Chinese are their superiors in the manufacture of porcelain proper. The Japanese employ glazing alloys of a kind unfamiliar in Europe, based generally on copper.

Sat'urn, an early Italian god who presided over farming, his name coming from the word meaning to sow. He most resembles Demeter of the Greek deities, but was later identified or confounded with the Greek Kronos. According to the Greek myth, Kronos the son of Uranos (heaven) and Gæa (earth) is the youngest of the Titans. He married Rhea, by whom he had several children, all of whom he devoured at their birth except the last, Zeus (Jupiter), whom his mother saved by a stratagem. The motive of Kronos was his hope of bringing to naught a prophecy which declared that his children would one day deprive him of his sovereignty, as he himself had done in the case of his father Uranos; but fate is stronger even than the gods, and when Zeus had grown up he began a ten years' war against Kronos and the Titans, ending in their being hurled down to Tartarus and there imprisoned. Other myths added that after his banishment from heaven Kronos went to Italy, where Janus gave him a share in his sovereignty. In this way Zeus' conquest of Kronos, a Greek myth, became the Roman myth of Jupiter's conquest of Saturn. Saturn thus became a divine king, who with fatherly mildness ruled the Italian natives and taught agriculture. Hence the whole land received the name of Saturnia or Land of Plenty, and his reign was that golden age of which later poets sang. Saturn's temple in Rome stood at the foot of the Capitoline hill.

Saturn. See PLAN'ETS.

Saturnalia (*săt'ŭr-nā'lĭ-ȧ*), **The,** most probably were an old Italian harvest-festival. During the festival slaves sat down to banquets in their master's clothes, while he waited on them at table. Crowds filled the streets, and roamed the city in a peculiar dress; friends sent presents to each other; all business stopped; the courts closed; schoolboys got a holiday; and no war could be begun. The length of the Saturnalia varied at different times in Roman history, but they were usually held on Dec. 17, 18 and 19. The modern Italian carnival seems to be founded on the old pagan Saturnalia.

Satyrs (*sā'tẽrs*), in Greek myth, were a race of woodland deities, half human, half animal. They are generally described as roaming the hills in the train of Dionysus (Bacchus). They looked grotesque and repulsive. They were of robust build, with broad, snub noses, large, pointed ears, bristly and shaggy hair, rough skin, little horny knobs on their foreheads and small tails. They were fond of the woodland nymphs, of music, dancing, wine and sleep. They usually were hostile to man. The Roman poets regarded them as the fauns of their own myths, and gave them larger horns and goats' feet. Satyrs were often sculptured; for example, Praxiteles' famous *Satyr* at Athens.

Saul, the first king of Israel, was the son of Kish, a wealthy chief of the tribe of Benjamin. Gigantic in frame, noble in mien and commanding in character, he was well-fitted to unite the tribes. His deliverance of Jabesh Gilead and his victories over the Philistines, Ammonites and Amalekites gave unmistakable proof of ability as a soldier. But soon he became possessed of a wild madness which found vent in an insane jealousy of David, his son-in-law and the chief of his bodyguard, and in a fit of rage attempted David's life with his own hand. Saul fell in a disastrous and bloody battle with the Philistines on Mt. Gilboa about B. C. 1020.

Sault (*sōō*) **Ste. Marie, Mich.,** a port on St. Mary River (*q. v.*), near the outlet of Lake Superior, 290 miles northwest of Detroit. Two canals around the rapids or *sault* yearly pass nearly three times as much freight as Suez Canal. An immense iron-bridge connects the railroads from St. Paul and Duluth with those of Ontario. Population 12,615.

Sault Ste. Marie, Can., the most important center in the District of Algoma, opposite the American city of the same name, is an important manufacturing place, as well as famous for its immense canal-lock, built by the Canadian government and opened for traffic in 1895, between Lakes Superior and Huron. A larger tonnage passes through the canals at Sault Ste. Marie per year than through any other canal-system in the world. Large pulp and paper-mills, iron-smelters, steel-rail mills and other important industries make up a large industrial population at this point. The canal was built to overcome the rapids on St. Mary River. The Algoma Central, running north from Sault Ste. Marie, has been a great aid in the development of the district. A rich mining district is tributary to it. The length of the canal between the extreme ends of the entrance-piers is 5,967 feet. The lock is 900 feet by 60 feet. Depth of water over the sills (at lowest water-level) is 20 feet 3 inches. The total rise or lockage is 18 feet. Breadth at bottom is 141 feet 8 inches; at the surface of the water 150 feet. This canal has been constructed through St. Mary's Island on the northern side of the rapids of the river and with that gives communication on Canadian territory between Lakes Huron and Superior.

Savan'nah, Ga., a city and port on Savannah River, 18 miles from its mouth. It is situated upon a level, sandy bluff 46 feet above the river. Its streets are broad and shaded by beautiful trees, and its parks or squares at every other intersection of its streets invest it with unique beauty. Forsyth Park (33 acres) is one of the most attractive places in the south. Bull Street, the principal avenue, contains monuments to Nathanael Greene, W. W. Gordon, Lafayette McLaws, Francis S. Bartow, Sergeant Jasper, Count Pulaski and the Confederate dead. Telfair Academy of Arts and Sciences contains the finest collection of art south of Washington. A new city-hall costing $300,000, a new post-office building of Georgia marble, a custom-house, five hospitals, orphan-asylums, and a new high-school are among its public buildings. The Roman Catholic cathedral of the state is here, and also Christ's Church where John Wesley, the founder of Methodism, first preached in America. The school buildings are among the best in the country, and $220,000 are spent annually to maintain its excellent system of schools, which have 12,000 pupils and 260 teachers. Savannah is the leading naval-stores port in the world and the third in cotton. Its commerce is the largest of any south-Atlantic port, and it is rapidly growing. The city is noted for its beautiful streets, buildings, extensive commerce, artesian water-supply and its attractive suburban resorts. Savannah was founded by Oglethorpe in 1733, taken by the English in 1778, and by Sherman in December of 1864. Its population in 1900 was 54,244, and now is 90,000.

Savannah River, which with its right branch forms the boundary between Georgia and South Carolina, rises near the southern border of North Carolina and flows southeast to the Atlantic. It is 450 miles long, and is navigable from November to June for large vessels to Savannah and for steamboats to Augusta.

Save (*săv*), a river in southern Austria, an important branch of the Danube, rises in Carniola, crosses Croatia, separates Bosnia and Servia on the south from Slavonia on the north, and falls into the Danube at Belgrade. It is 556 miles long and is navigable for 336 miles to Sissek in Croatia.

Savonarola (*să'vō-nȧ-rō'lȧ*), **Girolamo,** an Italian reformer, was born at Ferrara, Sept. 21, 1452. He was taught at home, and in 1474 entered the Dominican order at Bologna. He first preached at the Dominican convent of San Marco in Florence in 1482, where his harsh voice and lack of the graces of a speaker caused his lectures to be deserted. After seven years' absence in another convent he appeared again before the Florentines, and this time his sterling genius and enthusiasm gained complete success, as he preached against the sins and luxuries of Florence, then at the height of its wealth and brilliancy, under Lorenzo the Magnificent. At this time he stood well with the government, and the church, the pope appointing him vicar-general to carry out a reform that Savonarola had proposed in the Dominican order in Tuscany. But about 1493 he began to preach plainly at the government, and in one of his sermons he referred to the coming of the French under Charles VIII; when what he had foretold happened, Savonarola was one of the committee sent to welcome the French king as the savior of Italy. When the French were forced to leave Florence, a republic was established, of which Savonarola, without holding any office, became the guiding spirit, his party, who were called *Piagnoni* or Weepers from the character of penitence which they professed, being in power. Savonarola aimed at making Florence a model of a Christian commonwealth. Gambling and other vices were sternly punished; vanities of dress were ruled by law; and under the enthusiasm which this prophet stirred among the people women flocked in troops to the public square to fling down their costliest jewelry, and his followers made a "bonfire of vanities" including cards, dice and carnival costumes. Meanwhile his denunciations which did not spare even the pope himself — Alexander VI — and his followers' claim that he was a heaven-sent prophet arrayed the church against him. He refused to go to Rome to answer a charge of heresy, and refused the offer of a cardinal's hat if he would change his style of preaching, and kept on preaching when forbidden by the pope. He was then excommunicated; the elections at Florence were carried by the party called the *Arrabbiati* or the Enraged against Savonarola's upright but vigorous government; and lastly, a Franciscan preacher having denounced him, an appeal was made to the ordeal of fire, a Franciscan and a Dominican monk agreeing to make a trial of this dread ordeal to prove which side in this quarrel was favored by Providence. The trial was not made, owing to difficulties and disputes, the failure destroying Savonarola's prestige among the people. No longer having the support of Florence, he was tried by a church council, tortured, and condemned as a heretic and an enemy of the state. So, on May 23, 1498, this extraordinary man and two other Dominicans were strangled and their bodies burned by the executioner. See his *Life* by Villari (English translation); Mrs. Oliphant's *Makers of Florence;* and George Eliot's *Romola.*

Saw'fish, a cartilaginous fish related to sharks and rays, with the snout prolonged into a bony blade and sharp teeth along each edge. The body is shaped like that of a shark, and the saw sometimes reaches a length of six feet. There are 16 to 20 pairs of teeth in different species. These fish normally are inhabitants of warm seas. They abound in the Mediterranean, and are found about the West Indies and off the southern coast of North America. They attack whales and large fish. With the saw they rasp off flesh which is eaten, and sometimes they rip open their prey. Their nostrils and mouth with small teeth are on the under surface of the head near the base of the saw.

Saxe-Coburg-Gotha (*kō'bûrg-gō'tȧ*), a duchy in Thuringia, one of the German states, area 764 square miles, with a population of 257,208. The principality consists chiefly of two detached portions, the duchy of Gotha in the north and the duchy of Coburg in the south, the chief towns of which are Gotha (population 39,553) and Coburg (population 23,789). The reigning family, until 1893, was represented by Duke Ernest II, who was succeeded by his nephew Prince Alfred of England, Duke of Edinburgh, who died in 1900. A son of the latter, heir presumptive, having died in 1899, the duke of Connaught became heir to the ducal throne; but, as he with his son renounced all claim to the succession, the throne fell to the present incumbent, Charles Edward, son of Prince Leopold (Duke of Albany). The latter succeeded on July 30, 1900. There are 173 miles of railway, the chief products being agricultural and the crop consisting largely of rye, wheat and barley.

Saxe (*săks*), **John Godfrey,** was born at Highgate, Vt., June 2, 1816. He graduated at Middlebury College, Vermont, in 1839.

became a lawyer and for seven years practiced in his native county. For six years he owned and edited a newspaper at Burlington. He also served a year as state's attorney and ran for governor on the Democratic ticket in 1859 and 1860. Saxe's poetry was mostly satirical and soon gained great popularity, his first volume going through over 40 editions. Among his verses are *The Proud Miss McBride*, *The Money King* and *The New Rape of the Lock*. Saxe died at Albany, N. Y., March 31, 1887.

Saxe, Maurice, Marshal, a celebrated soldier of the 18th century, was the natural son of Augustus II, Elector of Saxony and the countess of Königsmark, and was born at Goslar, Hannover, Oct. 28, 1696. When only 12, he ran away to Flanders, joined the army of Marlborough, and took part in the capture of Lille and the siege of Tournay. With a boyish love of change he joined the Russo-Polish army in 1711 and distinguished himself under his father's own eyes. After fighting against the Turks in Hungary, he in 1726 was chosen Duke of Courland, and for three years stubbornly defended the duchy against both Russians and Poles. At length, forced to give it up, he fought under the Duke of Berwick, and decided the battle of Ettlingen by a desperate charge. On the breaking out of the Austrian War of Succession he was given command of an army to invade Bohemia, stormed Prague, and captured Egar. In 1744 he was made a marshal of France, put in command of the French army in Flanders, and with masterly genius kept a much larger force of the enemy inactive, at the same time capturing important fortresses. The following year was more glorious still; he defeated the Duke of Cumberland at Fontenoy, thus winning one of the greatest French victories over the English. Next year he won against the allies the brilliant victory of Raucoux, and in 1747 for the third time defeated Cumberland at Laufeldt and forced the allies to agree to the treaty of Aix-la-Chapelle. Saxe died on Nov. 30, 1750. George Sand was Saxe's great-granddaughter. See Carlyle's *Frederick the Great*.

Saxe-Meiningen (*săks-mī'nĭng-en*), a duchy in Thuringia, one of the states of the German empire. The charter of the duchy dates from 1829; its capital is Meiningen (population 15,985). The reigning duke is Georg II, son of Duke Bernhard I, who succeeded on the abdication of Duke Bernhard in 1866. The area of the duchy is 953 square miles, with a population, almost entirely Protestant, of 278,792. Like the duchy of Saxe-Coburg-Gotha, its products are mainly agricultural, the chief crops being rye, oats, wheat, hay and potatoes. It has 150 miles of railways.

Saxe-Weimar (*săks-vī'mär*), a grand-duchy of Thuringia, one of the German states, whose constitution dates from 1816. Its area (1,397 square miles, with a population of 387,316) consists of three detached districts — Weimar, Eisenach and Neustadt. The capital is Weimar (population 31,117), and the reigning grand-duke is Wilhelm Ernst. The government is an hereditary constitutional monarchy. The chief industry is agriculture, though there are some manufactures, mainly cotton and woolen. Weimar is famous as the home of Goethe, Herder and Schiller, the former long participating in the government. Duke Charles, about 1800, made Weimar the European Athens of his day.

Sax'horn, a series of brass, wind, musical instruments invented by Antoine or Adolphe Sax, who was born at Dinant, Belgium, in 1814, and settled at Paris in 1842. By means of this and another family of instruments called saxophones he has greatly influenced military music throughout the world. The saxhorn is a conical tube opening out to a wide bell, is sounded through a cupped mouthpiece, and is provided with valves or pistons like a cornet. Saxhorns are made in different sizes, the series having a very wide compass. Their number and variety supply all the different parts required by a brass band, and in many places good bands are wholly made up of them. From the fact that their fingering is all alike a performer having mastered one can by a little practice play as well on any of the others. Their compass, richness and flexibility of tone render them especially fit for military music, and their form makes them easy to play either on the march or on horseback.

Sax'ifrage. A genus of plants found in the north temperate and Arctic regions. It includes about 160 species, mostly perennial herbs, natives chiefly of mountainous tracts. Cultivated varieties are grown on rockeries. Some are densely tufted, moss-like plants, which form a flowery turf. The most common varieties in the United States are the early saxifrage found in Virginia, the swamp saxifrage in swamp-lands of Pennsylvania and the Chinese saxifrage, a hanging-basket plant. Cultivated varieties grow well in good soil. The seed should be sown as soon as ripe in a cold-frame; or saxifrages may be propagated by division in the spring.

Sax'ons, a Germanic people, whose name is thought to come from an old word meaning knife. A Saxon league was formed in the 3d century of tribes living along the Elbe inlet and on the neighboring islands. The Saxons invaded Roman territory in the reigns of Julian and Valentinian, and about 450 they, with the Angles, established permanent settlements in England (*q. v.*) and founded the Anglo-Saxon kingdoms. Before the 5th century they had settled along the French sea-coast from the Elbe to the

Loire, but these settlements soon became a part of the kingdom of the Franks. At home the Old-Saxons widened their country till it embraced all between the Rhine and Elbe, the North Sea and the Harz Mountains. Saxons and Franks together destroyed the Thuringian kingdom in 531. The Frankish war of conquest was waged against the Saxons from 719 to 804, the Franks at last conquering under Charlemagne, in spite of the stubborn defense of the Saxons under their leader Wittekind The Saxons gave up their pagan worship with their freedom, and accepted Christianity.

Sax'ony, a German kingdom, in area the fifth and in population the third state of the republic, it covers 5,787 square miles, and has a population of 4,802,485. For the present state of Saxony see GERMAN EMPIRE.

After the division of the territories ruled over by Charlemagne, the Frankish conqueror of the Saxons, that nation became a part of Austrasia. Its first duke was Otto (880–912). His son Henry made himself master of all the territories included in the present kingdom of Saxony, the Prussian province of Saxony, the smaller Saxon duchies and more besides. The German emperors after 1024 were Franconians and their greatest enemies were the Saxon dukes, especially Henry the Proud of Bavaria and Henry the Lion. Rudolph II (1356–70) first took the title of Elector of Saxony. During the Thirty Years' War Elector John George I (1611–56) sided with the Protestants, but in 1635 made his peace with the emperor, on which account his lands were ravaged by the Swedes for ten years. Frederick Augustus I (1694–1733) became a Roman Catholic and was chosen king of Poland. After that the headship of the Protestant states of Germany passed to the Elector of Brandenburg, and to this day the court of Saxony is Roman Catholic. Saxony warred against Charles XII of Sweden and suffered greatly at his hands; was defeated by Prussia in the second Silesian War; and was conquered by Frederick the Great in the Seven Years' War. Frederick Augustus III (1763–1827) proclaimed himself king of Saxony and sent his army to support Napoleon. For this the Congress of Vienna took over half his territory to form the new province of Prussian Saxony. In the Austro-Prussian war of 1866 Saxony sided with Austria, was defeated, and joined the North German Confederation. In the Franco-Prussian War the Saxon army fought on the side of Prussia, and since 1871 Saxony has been a part of the German republic.

Saxophone (*săks'ō-fōn*), the name of a group of musical instruments invented by Adolphe Sax. (See SAXHORN.) The saxophone is a conical, brass tube, sounded by a mouthpiece furnished with a single reed like that of a clarinet, and is made in as many different keys as the saxhorn. It has 20 holes, covered by keys and studs for the first three fingers of each hand. All saxophones are fingered alike. They are greatly valued in military music, but are not much used in orchestras.

Sax'ton, Joseph, American inventor, was born at Huntingdon, Pa., March 22, 1799, and died at Washington, D. C., Oct 26, 1873 At an early age he showed much mechanical ingenuity, which manifested itself later in inventions and improvements in connection with the mechanism of clocks; he constructed the clock for the tower of Independence Hall, Philadelphia, and superintended the construction of the machinery and delicate weighing-balances for the Philadelphia mint. He spent some years, early in the thirties, in England, and while there constructed a magneto-electrical machine, by which the first magnetic spark was obtained; he made much of the apparatus used by Wheatstone, the physicist and inventor; and devised a locomotive differential pulley Among his other inventions were a deep-sea thermometer, an immersed hydrometer and a self-registering tide-gauge. He was one of the founders of the American Academy of Sciences.

Sayce (*sās*), **Archibald Henry,** one of the greatest of living philologists and archæologists, was born at Shirehampton, England, Sept. 25, 1846. After attending Grosvenor College at Bath, he entered Queen's College, Oxford, in 1865, and became a fellow and tutor of his college. In 1876 he was appointed assistant to Max. Müller in the chair of comparative philology at Oxford, which he resigned in 1890 Professor Sayce was a member of the Old Testament revision-committee in 1874. The most important among his many books, which rank among the first in scholarship and value, are *Ancient Empires of the East, Fresh Light from the Monuments, The Hittites* and *Races of the Old Testament.*

Scale (in plants). The word has two applications. Epidermal outgrowths, which technically are hairs, sometimes assume the form of scales which more or less overlap one another. The more general application of the term, however, is in connection with the protecting leaves of scaly buds or the reduced leaves of underground stems. Such leaves are not green, are not much developed, and often are firmer than ordinary leaf-tissue. The scales of underground stems probably are merely reduced leaves, with no function; the scales of aërial buds. however, are distinctly protective organs, and not only are firm and resistant, but are frequently covered with hairs or gummy products.

Scale-In'sects, the name of a large number of flat insects, with scale-like bodies, of the family *Coccidæ*, also called scale-bug or bark-louse They live on the sap of plants. Almost all are looked upon as pests, doing much damage to fruit-trees, shade-trees and smaller plants. Among the most important are the cottony cushion or fluted scale; long-spined mealy bug; destructive mealy bug; cottony maple scale; barnacle; Florida wax; soft; terrapin; hemispherical; black; orange chionaspis; scurfy bark-louse; West Indian peach scale; horse-chestnut; Putnam or cranberry; linden; European fruit; cherry or Forbes; grape; walnut; palm, San José; greedy; oleander; circular; California red; Glover's or long; oyster-shell bark-louse; purple scale; white fluted or mealy wing. The cottony-cushion scale did a great amount of injury to trees in California, and was combated by introducing a lady-bird which preyed upon it. A scale-insect which forms a large cottony egg-case, making it a conspicuous object on the trees, has done much injury to maple-trees in various parts of the United States. The scale-insects infesting orange and lemon trees have done very great damage; including the long purple, Florida red and chaff scales, the orange chionaspis, California red, the white or fluted and the black. The San José scale has worked wide-spread damage in the country; the pest has spread from California to every state in the Union. It does not attack the citrus-fruits; but other orchards suffer greatly from it young peach-trees markedly so, and shade and ornamental trees are greatly injured thereby It is spread by nursery-stock and by fruit. When the pest is present, twigs are marked by a gray, scaly substance. Consult *Bulletin 88*, Mass. Agricultural College; Marlatt' *Farmers' Bulletin 172*, U. S. Department of Agriculture, 1903; and Comstock: *Manual for Study of Insects*. For remedies see SPRAYING-MIXTURES.

Scal'lop (*skŏl'lŭp*), numerous widely distributed and well-known mollusks inhabiting salt water. Their shells are marked with radially arranged ridges and are often bright-colored. The animal living within is somewhat like a clam, with a slender foot, orange or reddish in color. The mantle, which covers the animal and secretes the shell, is provided with many, small, sparkling eyes arranged around the margin. Those show when the shell is open. When young, scallops swim by opening and shutting the valves of their shells; but, as they grow older, they become sedentary. The larger scallop-shells are often used for baking and serving shredded fish and oysters in cracker-crumbs.

Scalp, the outer covering of the skull. Its skin does not differ from that of the rest of the body, except that hair grows on it more abundantly. Besides the skin, the scalp is formed of an expanded muscle or tendon and cellular tissue and blood-vessels. Scalping was a favorite practice of the American Indians in war, in which the scalp with the hair attached was partly cut and partly torn away, the victim being either alive or dead. The scalps were worn as trophies by the warriors.

Scan'dina'via, a long peninsula in the north of Europe, lying on the Arctic Ocean, the Norwegian Sea, the Baltic Sea and the Gulf of Bothnia. Geographically it includes Norway and Sweden, historically Denmark and Iceland, while its literature includes the literary works of the Swedish race in Finland even. See DENMARK, LITERATURE, NORWAY and SWEDEN.

Scarabaeus (*skăr'ȧ-bē'us*), a name commonly restricted to the tumble-bugs or dung-beetles, but properly including other members of the large family *Scarabæidæ*. The tumble-bugs form round balls of dung and roll them considerable distances, and finally bury them in the ground. The female lays an egg in this mass, which serves as food for the larva after the egg hatches. The most famous scarab is the sacred beetle of the ancient Egyptians. These were highly venerated and placed in tombs with their dead, where four different species have been preserved. A strange symbolism grew up in reference to these insects. The ball they rolled was taken to represent the sun, the rayed heads of the insects the rays, the 30 joints in their six tarsi the days of the month. They became accepted as emblems of power and resurrection. They are found sculptured on monuments and tombs. Gems were also cut in the form of the scarab and worn in rings and amulets. The Greeks and Etruscans borrowed this custom of engraving the scarabæus on gems.

Scarlet Fever (*Scarlatina*), an infectious disease, caused by micro-organisms not yet isolated, and probably most frequently contracted from the milk of diseased cows. The patient should be kept from uninfected persons, as the disease may be contracted from the breath, nasal and intestinal discharges, and clothes in contact with the body of a victim of the disease. After exposure, symptoms appear in two or three days. Headache, shivering, vomiting, sore throat, rapid pulse, and white-coated tongue are symptoms, followed in a day or so by a red eruption appearing first on the neck and chest. The rash disappears in about a week. Diseases of the eye, ear, throat, heart and kidneys may follow an attack of scarlet fever; so special care should be taken to protect these organs. Your doctor will prescribe the treatment to be given, which may include gargles for the throat, sprays for the nose, bathing preparations for the body, and medicines to relieve the fever. The room should be well ventilated. As nervous disorders sometimes follow an attack of the disease, the patient should be kept as much at ease as possible. The disease varies in intensity, some forms being more fatal than others. The rash, as a rule, can be easily distinguished from that caused by measles: see MEASLES.

Scar'let Tan'ager. See TANAGER.

Scheffer (*shĕf'fẽr*), **Ary**, a painter, was born at Dordrecht, Holland, Feb. 12, 1795, and studied in Paris. His first pictures were inspired by Goethe's, Byron's and Dante's poems, and included *Margaret at the Well*, *Faust in His Study*, *Suliote Women* and the well-known *Dante and Beatrice in Heaven*.

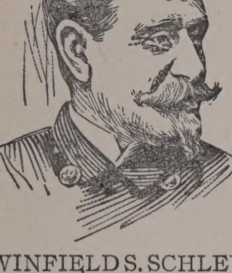
Scheldt (*skĕlt*), a river of Europe, rising in France, flowing north through Belgium past Ghent and Antwerp, enters the North Sea at Flushing by two arms, going north and south of two small islands. It is 267 miles long and navigable for 211 miles. The Dutch claimed the navigation of the lower Scheldt in the 17th and 18th centuries and demanded toll of all foreign vessels sailing on it. In 1831 the rights passed to Belgium when it separated from Holland. In 1863 Belgium gave up the claim for $3,750,000 paid by foreign nations.

Schelling (*shĕl'ĭng*), **Friedrich Wilhelm Joseph**, a German philosopher, was born at Württemberg, Jan. 27, 1775. He studied theology and philosophy at Tübingen and science and mathematics at Leipsic. He succeeded Fitchte as teacher of philosophy in the University of Jena in 1798. From 1803 to 1808 he was professor at Wurzburg; until 1820 secretary of the Royal Academy of Arts at Munich; professor at Erlangen until 1827, when he returned to Munich to a position in the new university there; and finally was called to Berlin by King William IV in 1841. He died in Switzerland in 1854. He began as a follower in philosophy of Fitchte and Hegel, with whom he ranks among German philosophers, but later was influenced by Spinoza and Boehme. His many philosophical works include the *Inquiry into the Nature of Human Freedom*, *The Possibility of Any Form of Philosophy*, *Philosophy of Nature* and *The World-Soul*. See Morell's *History of Philosophy*.

Schenectady (*ske nĕk'tȧ-dĭ*) **N. Y.**, a city, county-seat of Schenectady County, 17 miles northwest of Albany. It is on Mohawk River and Barge Canal and is a manufacturing city. It has the works of the General Electric Company, employing thousands of people, and the Westinghouse electric works; besides knitting-mills, stove-foundries, locomotive-works and pump, steel springs, wire-railings, wheelbarrow and broom factories. The principal public buildings are the post-office county court-house, municipal buildings, Van Curler opera-house, state armory, Home of the Friendless, Children's Home, Ellis Hospital and Y. M. C. A. building. It is the seat of Union College, founded in 1795, and with the law and medical schools and Dudley observatory at Albany and the academic and engineering departments in Schenectady, forming Union University. Schenectady has 22 churches and excellent parochial and public schools, the public high school being known as Union Classical Institute. This school owns its library and the city has a beautiful, free, public library. Schenectady was settled by the Dutch in 1661. In 1690 it was burned and the citizens massacred by the French and Indians. Population 120,000.

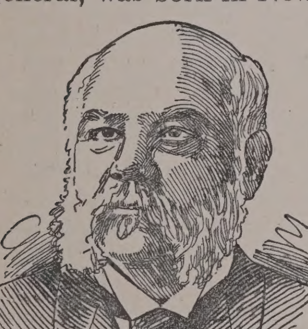
Schiller (*shĭl'ẽr*), **Johann Christoph Friedrich**, a German poet, was born at Marbach, in Württemberg, Nov. 10, 1759. He studied law and then medicine in the school at Ludwigsburg, established by Duke Carl Eugen of Württemberg, where he received three medals, though he had spent more time in reading and writing poetry than in studying medicine. His first play, *The Robbers*, in 1782, was produced at Mannheim. The people were so eager for it that they filled the theater at noon, five hours before the play began, and it made a tremendous sensation, being full of the revolutionary spirit that preceded the French Revolution. Because Schiller had twice left Stuttgart without the permission of the duke, he was arrested and forbidden to write plays or to leave Württemberg, which led to his flight to Mannheim under the name of Dr. Ritter. For a time he was dramatist to the theater in Mannheim and published a theatrical journal in which appeared many of his best poems and a part of *Don Carlos*, finished later at Dresden. He kept up his philosophical and historical studies, and in 1788 was given a professorship at Jena and a pension by the duke of Saxe-Weimar which enabled him to marry. His historical works of this period are the *Revolt of the Netherlands* and the *Thirty Years' War*. In 1794 began Schiller's friendship with Goethe, and under the stimulus of his intercourse with him he again began to write poetry, especially his ballads that have made him the people's poet. His drama of *Wallenstein*, written when every hour's writing cost hours of suffering, was finished in 1799. Carlyle calls it "the greatest dramatic work of the 18th century." Settling at Weimar in 1799, to be near Goethe, he wrote *Mary Stuart*, *The Maid of Orleans*, *The Bride of Messina* and *William Tell*, his last finished work. He died, while still young and in his intellectual prime, on May 9, 1805. See *Life* by Carlyle; *Life* by Nevinson in the Great Writers Series; and translations of *Wallenstein's Death* and *Piccolomini* by Coleridge.

Schlegel (*shlā'gel*), **August Wilhelm**, a German critic and poet, was born at Hannover, Sept. 8, 1767. He studied theology at Göttingen, but soon turned to literature, writing poems and other articles for magazines. He was made professor of literature and fine arts at the University of Jena, and lectured at Berlin on the same subjects and at Vienna in 1808. In 1818 he became professor at Bonn. He translated into German verse most of the works of Shakespeare and many of those of Cervantes, Dante, Calderon and Camoens. His translation of Shakespeare, revised by Tieck, is still the classic German version. His critical writings and his lectures were published in three collections. He died at Bonn, May 12, 1845.



WINFIELD S. SCHLEY

Schley (*slī*), **Winfield Scott,** rear-admiral in the United States navy, was born near Frederick, Md., Oct. 9, 1839. He graduated from the Naval Academy in 1860, and served during the Civil War. He was in command of the Greely relief expedition which sailed in 1884. As commodore he was placed in command of the flying squadron in the war with Spain, and for conspicuous service in the battle of Santiago (July 3, 1898) he was made rear-admiral. In the autumn of 1901 Admiral Schley figured in a court of inquiry arising out of professional controversies between himself and Admiral Sampson respecting the share of honors each was entitled to in the destruction of the Spanish fleet. He died Oct. 2, 1911.



GENERAL SCHOFIELD.

Scho'field, John McAllister, an American general, was born in New York state in 1831. A graduate of West Point, he was made a professor there in 1855. When the Civil War broke out, he entered the army as major of the 1st Missouri volunteers, and was on General Lyon's staff when the latter was killed at the battle of Wilson's Creek. He was in command in Missouri until February, 1864, and then of the army of the Ohio. He shared Sherman's southern campaign, and was in most of the battles which ended with the taking of Atlanta, when he returned to Tennessee, defeating Hood at Franklin, and was with General Thomas at the battle of Nashville. Entering North Carolina, he took Wilmington and again joined Sherman, for whom he drew up the supplementary articles of surrender of Johnston's army, which were afterwards approved by the government. In 1868 he became secretary of war and major-general in the regular army. Upon the death of General Sheridan in 1888, he succeeded to the command of the United States army. Previous to his retirement he was, by act of Congress, made lieutenant-general, Feb. 7, 1895. He wrote *Forty-six Years in the Army.* He died on March 4, 1906.

School-Garden, The. Among progressive school-people there is a growing interest in the school-garden. In cities, in normal schools and even in the country, the school-children are set to work cultivating flower and vegetable gardens. The school-garden is an outgrowth of regular school-work; it is one striking phase of the effort to get out of doors, away from books and into contact with the real world. It is a healthy realism putting more vigor and intensity into school-work.

The school-garden has an important relation to several school-studies. First of these is nature-study. There is no better way of bringing children into contact with plant-life than by raising flowers and vegetables in the garden. The boys and girls get out of doors, prepare the soil, plant the seed, watch with great interest the growth of plants, cultivate them through the season, and finally observe the growth and ripening of the fruit. This whole cycle of growth and change is the most fundamental thing in plant-study, and nothing can be more interesting to children than this process when they themselves are concerned in the products of the garden. In the second place the garden has a very important place in the study of geography. In the home-geography in the early grades classes of children are required to visit the gardens and study the processes of cultivation and marketing the products. These are fundamental lessons in geography. In this way gardening leads on to agriculture, scientific farming, fruit-raising and the improvement of country life generally.

There is a strong tendency in all parts of the country to turn the attention of children strongly toward these outdoor studies. The garden naturally suggests farming, the raising of corn and other grains, the feeding of cattle, dairying and butter-making, fruit-culture, as of berries, stone-fruits, apples and pears. Scientific agriculture and fruit-raising are based on principles of careful selection of seed and of wise cultivation, of fertilizing and preserving soils, of grafting, pruning and caring for fruit-trees and of spraying against insect-pests.

All these things are vitally interesting to children, and put new meaning into country life.

It has been suggested that school gardening will tend to create a feeling of mutual understanding between the urbanites and the farmers by arousing in the children of the city an interest in the country that will continue through manhood.

CHART 1 1375 SCHOOL SUPERINTENDENTS WOULD SUGGEST:*

Elementary School Curriculum

	First Choice	Second Choice	Third Choice
Add courses in citizenship	622	255	157
Add athletics and physical training for all	459	434	219
Add courses in morals and manners	322	233	322
Add religious instruction through the churches	212	123	207
Drop numbers and arithmetic in grades 1 to 4	39	51	38
Drop sewing, cooking, and manual training	40	45	61
Drop medical inspection and health work	4	15	17
Drop penmanship after grade 6	56	24	93
High School Curriculum			
Add athletics and games for all	605	262	212
Add rigid medical inspection and health work	439	361	104
Add courses in comradeship and mate-seeking	50	63	59
Add religious instruction through the churches	232	135	154
Arrange part time employment in stores, factories or farms with laboratory credits	194	135	164
Drop foreign languages	71	54	98
Make half the English work printing and reporting	56	54	94
Drop useless experiments in physics and chemistry	147	80	201

To read: Out of 1375 superintendents replying as to elementary course of study, 622 indicated first choice as addition of citizenship courses, 255 gave this as their second choice, and 157 as a third choice.

CHART 2 AVERAGE TIME ALLOTMENTS, IN MINUTES PER WEEK FOR 49 CITIES OF OVER 100,000 POPULATION*

Subjects Taught	GRADES								
	1	2	3	4	5	6	7	8	Total
Language	130	141	167	176	187	194	207	215	1417
Reading	421	404	332	245	182	141	142	136	2003
Spelling	39	82	87	85	82	78	72	73	598
Penmanship	67	72	77	78	77	75	63	58	567
Arithmetic	64	143	193	206	211	211	212	211	1451
History	17	19	30	54	84	97	148	167	616
Civics	9	12	11	12	14	15	23	27	123
Geography	11	14	59	137	156	162	137	84	760
Science	22	23	23	23	21	21	22	26	181
Hygiene	16	16	18	22	27	27	25	22	173
Physical Training	90	87	89	90	90	89	98	104	737
Supervised Play	22	19	18	14	16	16	16	15	136
Recess	105	106	106	96	91	90	84	74	752
Industrial Arts	22	22	25	30	50	65	90	106	410
Drawing	87	88	87	86	82	75	77	79	661
Music	71	74	74	77	76	74	70	75	591
Miscellaneous	97	93	99	97	99	98	88	87	758

Language includes composition and grammar; reading includes phonetics, literature, stories, dramatics; science includes nature study and gardening; industrial arts includes hand work, wood and metal work, domestic science, etc.

CHART 3 AVERAGE TIME DISTRIBUTION IN 14 REPRESENTATIVE JUNIOR HIGH SCHOOL SYSTEMS*

Year	A	Art	Eng.	Home Eco.	Geog.	Indust. Art	Math.	Music	Science	Health	Soc.
Seventh	A	82.9	302.8	180	164.6	175.8	237.9	70	132	150.2	240
	B	5.2	19.5	11	10.5	10.3	13	4.2	7.7	9.2	15.1
Eighth	A	85	269.8	125.2	152.5	169	242.2	67.6	178.3	157.1	248.4
	B	5.4	16.2	7.7	9.7	9.8	14.3	4	10.5	9	14.4
Ninth	A	120	265.7	335	....	183	303.7	72.3	195	147	190.7
	B	7.5	17.2	17.1	....	11.5	18.3	4.3	11.6	8	10.9

A is number of minutes per week. B is proportional distribution in percentages.

*Above charts are from the Second Yearbook of the Department of Superintendence of the National Education Association of the United States. Table 2 was compiled by Fred C. Ayer, Director of Research, Seattle Public Schools, and is an adaptation in this form. Table 3 was compiled by James M. Glass, Director of Junior High Schools, State Department of Education, Pennsylvania.

Related Topics): Montessori Systems, Schools (Elementary and Rural); Teaching (Project Method, Supervised Study); Normal Schools; Schools, Secondary; Education; Pedagogics; Public Schools, *The New Student's Reference Work.*

The school-garden even has an important relation to esthetics. Floriculture, landscape-gardening, tree-planting and fruit-culture appeal to the sense of beauty. The whole yard and garden together need to be planted and laid out on principles of taste and attractiveness.

Perhaps the most important relation of the school-garden is that to the home. Where boys and girls become properly interested in the school-garden, they naturally desire to raise a garden at home in their own back-yard and perhaps flower-beds and trees in the front yard. This answers in many ways to the necessities and comforts of the home. The whole town may take on a new appearance, in its yards and gardens, on account of this interest developed in the school-garden. Beauty and utility are here combined in the best way; the home-table is supplied with vegetables and beautified by the flowers which the children themselves raise.

The educative effect upon the boy or girl of carrying out through the whole season plans for cultivating a garden is one of the best products of good training. The cultivation of plants requires constant attention, forethought, intelligence, self-reliance and a kind of originality; difficulties are to be met and overcome. Insects infest the plants and must be gotten rid of; chickens scratch up and spoil the garden and a fence is needed for protection; a dry spell calls for some plan of watering; weeds quickly take possession of a garden; and the child must be intelligent and thoughtful in meeting such difficulties. This is the best kind of training. To say the least, it is far better than letting the boy run wild on the streets and getting into all sorts of mischief.

Most of our progressive normal schools in all parts of the country are taking up the problem of school-gardens, not for the children simply but for the teachers. Young teachers are set to work to learn the whole problem, so that they may later guide the children in garden work. It is clear that the school-garden is to occupy an important place in the future education of boys and girls.

The value of school-gardens in education has long been recognized in Europe. They were started as early as 1819 in Schleswig-Holstein. In 1869 they were prescribed by law in Austria and Sweden, in Belgium since 1873 and in France since 1880. There are at present about 20,000 schools in Austria having gardens, 45,000 in France, 8,000 in Russia and 2,500 in Sweden. The number in the latter country once was double the present number, but has decreased since the introduction of manual training. School gardening is practically obligatory for the children of the common schools of Belgium, Netherlands, British West Indies and Ceylon. Many German cities teach agriculture by "demonstration" in which the pupils are not allowed any share. Many of the schools of France and Germany have gardens "not with a view to instructing the pupils in agriculture, but for the benefit of the teachers." Many of the foreign governments subsidize the school-gardens, offer prizes, and make training in agriculture obligatory for normal-school graduates.

It may be said in conclusion that school-gardens have an important relation to manual training and to the whole subject of industrial education. It is a phase of manual training to teach children to use the tools and implements of the garden, to prepare the soil and carefully cultivate plants. It is an outdoor physical training combined with intelligent mental effort quite equal in its effects to shop-work and in some ways superior.

Some of the great universities, like Cornell, Illinois, Ohio and Louisiana, have taken up the problem of school agriculture, country life and scientific farming in earnest Pamphlets are published by experts of agriculture dealing with important phases of school agriculture and school-gardens. Consult Jewell's *Agricultural Education* (Bul. 368, U. S. Bureau of Education).

C. A. McMurry.

School Or′ganiza′tion and Man′agement, as a somewhat distinct problem calls for elaborate treatment. It embraces the plans of organization, the sources of revenue, the selection of school-sites, the erection of school-buildings, seating, ventilating, lighting and sanitation; the courses of study, choice of textbooks, classification of pupils, preparation and examination of teachers; the general supervision of the school, the authority of the teacher, the management of the classes, rules of conduct, modes of punishment, presentation of motives, relation of teacher and pupils. The student is referred to the following authorities for a general treatment of these problems: *School Economy*, Wickersham; *School Supervision*, Payne; *School Interests and Duties*, King; *School Management*, White; *School Management*, Kellogg; *Theory and Practice of Teaching*, Page; *Systems of Education*, Gill; and *School Hygiene*, Kotelmann (Bergstrom's translation). For detailed treatment of special phases of this broad subject see *Teacher's College Contribution to Education*, Teacher's College, Columbia University.

School San′ita′tion may be defined as the application of knowledge and of the laws of science with a view to the preservation and promotion of the health of those attending school. Formerly the term included little more than the proper heating, lighting and ventilation of school-buildings; but it has been extended to include all factors with which it is practicable for the school to deal, which concern the health of the pupil, as the detection of defects of sight and hearing, contagious diseases, adenoid growths, causes of malnutrition. In some schools even the teeth of the children are periodically examined by a dentist, who gives free individual advice regarding their care.

As to heating and ventilation, in general that system will be the best which will in the simplest way possible effect an even heat throughout, with sufficient change of air and avoidance of direct draughts upon the pupils. Fire-places are very desirable whenever architectural conditions will permit them. When in use, they insure the best of ventilation and are excellent for furnishing the small amount of heat often required in spring and fall. If a stove is used for heating purposes, it should be surrounded by a zinc jacket extending from the bottom to a distance of several feet above it, to prevent direct radiation. Air is heated at the bottom and rises to the top of the jacket and thus a fair degree of circulation is insured. The chimney should be large and bisected vertically, half being used for the escape of smoke and the other half for the escape of foul air. In large buildings a force-fan is necessary to insure continuous circulation. This can be provided at small cost. Good ventilation demands 2,000 cubic feet of pure air *per* pupil *per* hour. Teachers should assure themselves from time to time as to whether the ventilation system is working, by seeing whether there is sufficient draught up the foul-air flue to draw in a small scrap of paper. For large buildings heating by steam-pipes is preferable to that by hot air, as with hot air it is difficult to have the heat evenly distributed on windy days.

The essential thing in lighting a schoolroom is to secure sufficient light without having it fall directly upon the eyes of the pupils or teacher. For this reason it is best to have all the light come from one side of the room, preferably from the left.

Such good school-desks are now manufactured that there is no excuse for the failure to have pupils hygienically seated at desks adapted to their size.

Teachers should always be on the alert for the detection of any physical defects in their pupils, and these when noticed should be reported at once to the proper persons. Every school should be examined from time to time by a physician with reference to the physical defects of the children.

School-Ships are used to train officers and gunners for the naval service. In the United States seamen-gunners are trained at Newport and gun-captains on training-ships at Port Royal, S. C. The old English battleships *Britannia* and *Hindostan* at Portsmouth, England, are used as school-ships. School-ships are sometimes employed as reformatories, but even in this case they graduate most of their pupils into the navy.

School-Song, The. Since the rote-song in music, like the story in literature, proves to be the "Open! sesame" of interest to the child, a careful selection of such songs should be made for their initial educational value. The following examples serve to illustrate the uses of song in meeting the problems of music-training for school-grades. The work is divided into three periods: Imitative and Dramatic Period; Investigative Period; and Constructive Period, the different steps showing the development of the subject.

IMITATIVE AND DRAMATIC PERIOD.

In the popular musical pleasantry, *The Chicken*, by Neidlinger the entire spirit of the words is carried over into the music, which naturally represents their meaning in pitch and vocal inflection:

I think when a little chicken drinks
He takes the water in his bill
And then he holds his head way up
So the water can run down hill.

Much to the delight of the little child the water musically "runs down hill" through the descending scale-passage, while the entire song blends speech and song.

The Call of the Crow is a charming bit of musical imaginery by Mrs. Knowlton. To a melodious accompaniment is given the simple call of the crow on two notes for the middle voice, which may be realistically interpreted by the children at first. Later the *caw* suggests a natural vocal lesson, opening and relaxing the throat as adequately as would an Italian exercise. In the two chanting phrases which follow, speech and song are blended:

Over the standing corn
The cheery cry is borne.

Such words as "corn" and "borne" suggest vocal emphasis upon round, open tones. A change of mood is shown at the close in an accompanying note of regret to the words:

How I wish I could go with him,
Where the woods are wild and dim.

The entire song is made on five notes of the scale and, while naturally told, is thoroughly musical and poetic.

The familiar *Mother-Goose* rime set to music by L. Orth:

Blow, wind, blow; go, mill, go,
That the miller may grind his corn;
That the baker may take it
And into rolls make it
And fetch us some hot in the morn.
Blow, wind.

gives contrasting movements, slow and fast; broad, full vowels of the first phase, short, quick vowels and rapid enunciation in the second part. The words and increased *tempo* suggest action, the turning of wheels, grinding, kneading and baking. The whole song is an action story which the children will take pleasure in representing. The broad vowel and breathing involved in the word "blow" furnish the material for a good music-lesson, as does the *tempo*, fast and slow, which can be converted into accented time and divided beat, again to be defined by clapping, tapping or marking on the board. The last part of the song repeats phrases of the first and second part, thus closing in good musical form. In this song we have a capital story in music and words, vowel-coloring, repetition of phrases, rhythm, dramatic representation and musical form, besides the suggestions arising from a well-composed accompaniment.

Stevenson's *Bring the Comb* (Modern Music Series, First Book) pictures a mimic band and soldier drill, presenting the problems of rhythm in a playful way. The soldiers mark time and keep step to the drum-beat of the two strong pulses of the measure. In clapping out the pattern of the fife and rat-a-tat-tat of the snare-drum and, later, with the aid of drums and toy instruments, the children define the melody, learning to contrast the elements of time and tune.

For further illustrations in pitch and time, such songs as *The Chicken* and *Katydid* (Knowlton) will be helpful for pitch-studies in high, low and medium tones of songs. Neidlinger's *Robin* and *Squirrel* give good practice in ascending and descending passages. The rhythmic suggestion in *Snow-Balls* and *Scissors-Grinder* (Knowlton) will be freely acted. Favorite rhymes and *Mother Goose* will serve for initial time-lessons in recognizing groups of twos, threes and fours. Miss Bentley's song-primer, the *Zoo*, *Clock* and others give happy suggestions of scale, pitch, time and rhythm lessons for this first period.

First Step. Through these songs the child is introduced to a concrete, musical experience, which must tend to vitalize all his later study. Here he learns to express himself freely in song, to respond to rhythm and to appreciate harmony. On account of his limited power, he will distribute his interest equally over words, rhythm and melody. The words of the song will be helpful in enlarging his vocabulary, in making associations with color, sound, motion and number. The motor-side of music will strongly appeal, leading out into gesture and dramatic action in rhythms, games and dances. The child also becomes familiar with a variety of musical forms, which prepare him for future analysis and reasoning.

Advanced Step. The ear-training and naming of pitch from songs of the preceding stage are followed by translating from memory into syllables; also by recording them in notation. This will be found a helpful transitional step to the sight-singing of the next grade. Simple tonic phrases from Knowlton's *What Robin Told*, *The Crow*, *The Postman*, *The Soldier*, "Workshop's Primer" (Modern Music Series) have been offered by the children, when asked to sing parts of songs from memory.

Original song-making on the part of the children at this period helps to define the phrase and lead to music-construction. The song-sentence, the couplet and quatrain both in words and music can thus be produced, acquainting children with meter and time groups in a practical way.

Folk-games and dances related to the work of the grade carry on the training in rhythm and unite the musical experiences in a larger dramatic whole. Some of the old guild-dances, *Shoemaker*, *The Wool-Weaving* and *Harvest-Dances* of a more formal kind take the place of the freer dramatic games of the earlier period.

The teaching points to be gained might be stated as follows: To gain the expressive use of song,

1. The character of the song should be dramatic and directly related to the child's interest and to school subjects. The song should be used as a story, told in simple language with melody and rhythm directly representative of the content of the words.

2. The vocal aim at this period is to gain fluency of utterance in word and tone. A close relation between tone and language should be kept by means of a study of imitative sounds and words, as expressed in the songs. The children should learn to recognize and group sounds by their qualities, as round, sharp, bright, rolling or humming, leading to combined vocal and reading phonetics. In this way simple vocal exercises in *oh*, *ah*, *e* and *oo* will be drawn directly from the song, as suggested in the *Blow, Wind.* Breath-exercises should be developed in the same way.

3. Pitch will first be discovered as sounds in nature and environment are represented, in such songs as *Call of Crow*, *Katydid* and *Steam-Whistle.* This will first be described as high, low and medium, gradually defining the scale. The sequence of tones, or expressive pitch used in the phrases of the songs, develops melody.

4. Rhythm will first be defined by the motions and movements of the body, power to walk, run, skip and march, in the imitations of nature and movements of things these will be further defined by clapping, marching, skipping and acting the various songs as above shown. Thus the pulse or beat becomes recognized by the child through his own self-activity.

5. Corrective work. At this period the monotones can be treated in a special group, ear-training and individual help being given to those deficient in music.

Books of reference: Elliott's *Mother Goose;* L. and J. Orth's *Mother Goose;* Reinecke's *Children's Songs:* E Smith's

Kindergarten Songs (Vols. I. and II); Neidlinger's *Small Songs for Small Singers* (in *Earth, Air and Sky* Series); Knowlton's *Nature Songs;* Hill's *Songs for Children,* Bentley's *Song Primer;* Hofer's *Singing Games* and *Popular Folk Games and Dances, Modern Music Series;* Primer, First and Second Book, Ed. Music Course, Ginn and Co. See *Teacher's College Record,* January, 1904: *The Teaching of Elementary Music* for fuller discussion of this subject.

INVESTIGATIVE PERIOD

First Step. Proceeding into the second period, songs become more and more the material for theoretical investigation on the part of the pupil. In this distinct stepping over, the esthetic element of song is pushed somewhat into the background. To avoid the dullness which usually creeps into singing at this point, the situation should be strongly reinforced with interesting descriptive songs, which still retain their vital qualities.

Illustrations: *Patriotic Song,* Knowlton, a vowel study in *e* and in broad phrasing. Translate into pitch names. *The Woodpecker,* sustained singing and rapid enunciation — writing of phrases. *The Fireman,* vocal imitation of bell and whistle — study in pitch. *Wind-Song,* clear, ringing tone — illustrates use of chromatics, sharps and flats. *Squirrel's Thanksgiving,* rapid passages in crescendo and diminuendo — study in time and divided beat. *The Mill,* soft, vibratory singing — study in monotone and climax. *Primer* and *First Book* (Modern Music Series).

At this time more formal vocal exercises can be given and the range of voice extended, as it is now inclined to be most brilliant in quality. All singing should be light and carefully reinforced, with suitable breathing and physical exercises to avoid straining the fast-maturing vocal organs. The following exercises are suggested by needs of songs: viz., *Patriotic Song* and *Woodpecker* — deep sustained breath to support high tones *Fireman,* expulsion of breath on "ding-dong;" *Mill-Song,* pouring breath on in steady stream; *Squirrel,* chasing tones with breath. Following these lines, vivid interpretation induces active bodily response on the part of the pupils and corrects bad position.

Advanced Step. Interesting songs with which to help advancing sight-singing at this period are the *Round and Catch,* the familiar folk-ditties known as *The Three Blind Mice* and *Chairs to Mend,* where a distinct melody capable of harmonic repetition is given. This is an excellent device for avoiding the "growling" of a second part, the usual attempt at alto singing without sufficient reading knowledge. These with the two and three-voiced canon make a natural and pleasurable approach to part-singing, and also show the development of the period and simple song form.

The simple classics on general subjects usually introduced into school-music books for this period here serve a good turn. Part-songs in thirds, sixths and octaves can be introduced in connection with these. The importance of part-singing can be emphasized by letting these middle grades sing an alto melody against the other parts in general school-exercises. Interest should be stimulated in general school-singing through the easier American, Scotch, Irish and German folk-songs, of simple emotional content and not too extended range. A list of these would include *Dixie, Kentucky Home, Tenting To-Night, Fir-Tree, Lorelei, Keel Row, Campbells are Coming, John Peel, Hunt Is Up, Wearin' of the Green, Canadian Boat-Song, Blue-Bells of Scotland* or *Santa Lucia.*

References: *Songs for Schools,* Farnsworth; *Songs Every Child Should Know,* Bacon; *Folk Songs,* Ditson; *Modern Music Series,* Second and Third Books; *One Hundred Rounds,* Boosey and Co.

CONSTRUCTIVE PERIOD

The next cycle of development includes the upper grades and the high school. The character of the work of this period is synthetic, aiming to unify the free investigation of the material of the previous stage.

First Step. From the study of rounds and easier part-singing the pupils should settle into steady and ready sight-singing. This material is easily supplied from the various school-music courses in short, bright choruses and glees, supplying practice in time and interval difficulties, harmonic and key changes. Rapid passages in thirds and sixths may be found in the gay folk-songs and in more elaborate musical compositions, found in the Modern Music Series, Third and Fourth Books; in *Songs of Life and Nature* by Smith; and in other music-readers.

Advanced Step. In order to teach the bass clef, songs are given with the melody arranged for the boys in the bass, thus introducing them in a practical way to their own realm of music-reading. Pages 136, 150 and 168, Third Book, Modern Music Series, serve to illustrate. McFarren's *Harvest-Home* of this series is a very good illustration of the bass used as an accompaniment to the gay, bright obligato in the soprano. This can only be used where the boys' voices have changed.

Studies in harmony can now be carried forward through the analysis of the hymn and singing in parts. This will aid in the structural understanding of music. Examples used are *America;* the harvest-hymn and processional, *We Plough the Fields; A Mighty Fortress; Crusader's Hymn.*

HIGH SCHOOL

Music in the high school presents difficulties peculiar to this age. Change of voice, increasing self-consciousness, the uneven training and grading as to musical knowledge — all these make high-school work the most difficult and least satisfactory from a musical point of view. For ungraded classes the descriptive unison chorus, sufficiently mature to meet the advanced taste of the pupils, may be used. Among this list would be classed the more difficult national and patriotic songs; *Scots Wha Hae, Minstrel Boy, Marseillaise, Sword-Song, Fatherland Hymn, Greig*, and college and popular songs. In a well-trained chorus having the brilliant quality of the soprano voices, altos chosen from the medium voices, with a sufficient power in the bass, the more elaborate school-choruses can be attempted in parts. Among these are the well-known favorites: *Soldier's Chorus* in *Faust, Pilgrim's Chorus* in *Tannhaüser, Spinning Chorus* in *The Flying Dutchman* and *The Heavens* by Beethoven, various selections from popular operas, descriptive and national music. The enlarged content of these demands increased vocal ability and power as well as a reading knowledge which is not usually found. *The Laurel Song-Book and Reader* by Birchard may be quoted for these. Where time and interest permit, a correlation with history and literature can be made through such noble songs as are here supplied. The Novello editions of national and folk-songs will also be found useful in illustrating Russian, Scandinavian, Eastern European and other national music.

GENERAL ASSEMBLIES AND FESTIVALS

To keep the spirit of music alive in the school there should be a continual oncoming body of song from all the grades. Anniversaries, national days, seasons and festivals should be the objective point of the musical programs of the year. Less time should be spent on uninteresting exercises for the elucidation of musical theory and more given to the preparation of *ensemble* material for the enjoyment of all. The standard literature of music in choruses, hymns, patriotic and national songs, selections from choral works, even the giving of cantatas, would fairly represent a *public-school*, not a college, course in music. It is not the function of public-school music to produce the finished artist, but to make for common standards of training in the democracy of art, of which our country stands in such great need.

MARI RUEF HOFER.

Schools, El'emen'tary. The conception of elementary education most agreed upon may be said to be that of training in literacy. Such a view refers, of course, to education given in the school as distinguished from that training in manners, morals and skill which is given in the home or by general social intercourse through imitation, apprenticeship, etc. It covers the common element involved in those systems where elementary is simply preparatory to secondary education and those in which it is synonymous with popular education or such as is given to the masses. These two types have been differentiated and again united in history in such a manner that a sketch of the rise of popular education is almost indispensable to a comprehension of the problem of elementary education to-day. In the middle ages literary education was confined largely to the clergy and the professional classes. With them it was such training in Latin as would prepare them to understand the church services, legal or medical terms, or to read the literature of theology, philosophy, medicine or law. Such training was not supposed to be necessary or even desirable for the mass of the people. The Reformation brought the idea that the Scriptures should be read by all, and also such translations as made it necessary to learn only the modern tongues in order to accomplish this purpose. Popular systems of education began to make their appearance. The Duke of Württemberg adopted a plan for vernacular schools in every village in 1559. This step was imitated by other German states, and in 1619 Weimar decreed that attendance on such schools should be compulsory for the common people. In Holland the Synod of Dort in 1618–9 decreed that elementary schools should be established in every parish. In Scotland an effective system of parish schools was inaugurated in 1696. Massachusetts passed a law in 1647 providing that every town of 50 families should have an elementary school. In France a Catholic order, the *Brethern of the Christian Schools*, established in 1684 by Jean Baptiste de La Salle, emulated the activities of the Protestants in popular education. This order became widely influential, and is notable especially for its system of teaching children in graded classes rather than as individuals. In England it was not until early in the 19th century that two societies, the British and Foreign School Society and the National Society, began the work out of which the English elementary system of to-day has been constructed through the coöperation and, later, the supervision and control of the state.

In its beginning this popular education aimed at religious ends. It in general was very meager, being confined largely to religious instruction and some little training in reading and writing. The great revolutionary social and political movements of the 18th century may be said to have yielded their richest fruit in the reconstruction of these schools. Popular education is essentially the achievement of the 19th century. It rests on the notion that education should be universal, that its aim is not merely religious, but rather to prepare for intelligent political activity, a purpose especially emphasized in the United States by Horace Mann, and that the emancipation of the mass of mankind demands not merely power to read and write and some knowledge of politics, but such training as shall insure to each the power to make a respectable if not comfortable living. The last idea may be said to be the special contribution of Pestalozzi, the Swiss reformer, to modern educational doctrine. He perhaps was the most influential man in determining the aims and methods that prevailed in the reconstruction of the system of education in Prussia and other German states in the early part of the 19th century. This movement involved the expansion of the curriculum to include arithmetic, geometry, geography, nature-study, literature, history, drawing, music and, especially, such manual and technical training as seems best adapted to prepare for the vocations of the people of the neighborhood. The eight or nine years' course in the German folk-school may now be supplemented by a course in the continuation-schools, held usually in the evenings or on Sundays and especially offering vocational instruction, or in technical or trade-schools which everywhere abound. Elementary teachers are usually well-trained in the normal schools. All schools have now become state institutions. No one can open a school without official sanction. Practically all elementary instruction is still supported and controlled by public authorities. Careful supervision and inspection exist. Teachers are pensioned on retirement from active service. Compulsory-attendance laws are strictly enforced. Illiteracy has practically disappeared, and efficiency in the various vocations has enormously increased through this system. In France the foundations of the present system were laid by the law of 1833, but it was not until after the Franco-Prussian War that it became highly efficient. The same features exist as in Germany, except that control and support are more highly centralized. The administration at Paris through its officials appoints the elementary teachers, provides their salaries as well as liberal contributions for buildings etc., and inspects the schools. During the last decade nearly all the schools maintained by Roman Catholic teaching-orders have been suppressed, so that elementary education, as in Germany, is practically in the hands of the state. At the same time the French schools, unlike the German ones, pay little attention to religion. In England, also, elementary education has become free and compulsory, supported largely by public funds, inspected and to a great extent controlled by state officials. The religious societies still control the training schools for teachers and many of the elementary schools. The dominance of the Anglican church in elementary education is a source of bitter contention to-day in British politics. As in other European schools, vocational efficiency has come to be a leading object in English popular education.

In the United States the free schools, at the time when Horace Mann undertook their reform (about 1835) were poorly supported and taught and not patronized by those who could afford to pay tuition. As a result of the agitation that he began, the public elementary schools of Massachusetts, hitherto supported solely by the localities, received state aid normal schools (*q. v.*) were established for training teachers, better inspection was provided, the school-year lengthened, the curriculum enriched, and in general the aim that the public school should be made so good that no one would resort to private instruction on account of their inefficiency was realized. Other states quickly followed Massachusetts, and to-day the opportunity to receive an elementary education is practically universal throughout the nation. In general it may be said that about 18 per cent. of the fund for the support of schools comes from the states, while about 68 per cent. comes from local taxes. The state-fund is especially important in sparsely inhabited regions. In New England the unit for the organization and control of schools is the township. In the south it is the county. Elsewhere in the nation the district as a rule is the unit, but a combination of district, county and state control and support exists.

In comparing elementary education in the United States with that in Europe, we notice that it is inferior in completeness of organization, in carefulness of inspection, in compelling attendance, in pensioning teachers and especially in offering technical and trade education. On the other hand American education offers more opportunity for originality and independence both in teachers and in pupils. The elementary school in the United States is not for one class in society but for all. It is not differentiated from the secondary school, but prepares for it as well as for life. Herein is to be found doubtless the reason for the slowness with which elementary technical education has developed. Such training prepares for a special vocation; but our system tends to hand that over to the secondary school, reserving for the elementary school only that preparatory and liberal training that enables one to get some appreciation of the various lines of human culture before entering upon a course calculated to prepare for a trade, business or a profession. See Education, History of; Education, Modern; Normal Schools; Schools, Rural and Schools, Secondary. E. N. Henderson.

Schools, Open Air, organized first in Prussia in 1904. The regulations vary, some schools taking normal, others defective or tubercular children, and providing entirely for them or merely following a regular school curriculum. The children study, play and recite out of doors even in very cold weather.

Schools, Junior High. Supplanting the former arrangement of grades in school—eight in the grades and four in high scool—the junior high school offers many advantages. Its pupils come to it after six years in the grades, and they progress after three years to senior high, where they spend another three years. In its curriculum the junior high resembles the senior high. The students take a variety of subjects and have a variety of teachers. In this way better instruction is possible since each teacher is specialized and more expert in one field. The wide range of subjects open to the student helps to lay the foundation of a broad culture. Fields of which he was before ignorant or even contemptuous prove, on trial, to be interesting, perhaps worthy of continued life work in them. Not only that, but an initial interest in one subject, not touched upon in the grades, can be indulged and supervised. Thus the junior high usually offers courses in woodworking, sheet-metal, mechanical drawing, bookbinding, art, and various other lines of shop work, in addition, of course, to the usual academic subjects such as English, languages, mathematics and sciences. By choosing these fields of endeavor the junior high attracts many students who would otherwise abandon school after the former eight grades. Those already in junior high are reluctant to quit before finishing it, at least, and the progression to senior high is inviting. The junior high gives, even to the one to whom it is his last formal schooling, knowledge that will prove of value in any field of endeavor. In fact the selection of that very field, that vocation, may come about as the result of an impetus given at the school. That is what its authorities endeavor to give. In many schools a separate short-hour course is given specifically in vocational study. The junior high student is not too young to begin to find himself, his interests, and what he should do in life. Coupled with the chance to do this, is the opportunity given to develop qualities that make for practical success. Students will be set at putting together the parts of an automobile, at producing and enacting plays which they have composed, perhaps, under the inspiration and documents of their history book. Such enterprises encourage initiative. So too does the Dalton plan, in wide use. Roughly, under this plan, which is practical for junior high, students work on assignments by themselves, with only occasional formal classes. The able student is not retarded by the slow one, and both have greater incentive to do good work without loss of time. For a further discussion of advantages and disadvantages see "Dalton Plan."

Schools, Rural. The days of "the little red schoolhouse" are not yet over, though centralization is gradually bringing newer and better conditions. In the United States in 1927 there were about 175,000 One-room school houses, filled with 4,000,000 students.

The curriculum of the organized rural school is usually eight years in length, and is composed of the recognized elementary or common-school subjects,—reading, writing, arithmetic, spelling, English grammar, geography, United States history, civil government, physiology and hygiene. Of recent years some of the more progressive states have added instruction in elementary agriculture, manual training and domestic science. Instead of being a graded school, that is, one made of pupils of nearly the same age and advancement, studying the same subjects together in classes, the rural school in the majority of cases is an ungraded school. In the smallest schools each pupil is a class by himself. In the large schools the whole number of pupils is divided into three or more groups for teaching. By law in most of the states all public schools must be taught in the English language, although in some sections of the country instruction is actually carried on in other languages; for example, in Louisiana teaching in the French language is permitted in those localities where the French language predominates and in New Mexico in Spanish where that language is largely employed. While the typical rural school gives instruction of only elementary character, frequently secondary or high-school subjects are included. The establishment of rural and township high-schools and the consolidation of schools, particularly during the last decade, have greatly increased the opportunity of country children for a better and more advanced education.

Organization and Government. All of the public schools of each state are organized into a system. Every public rural school, then, is a state institution and, as such, falls to some degree under the control of a branch of the state government, which is usually presided over by a state superintendent of public instruction or a state board of education. In practice the actual control over any particular school is exercised by school-officers, elected by the people of the locality or chosen by the state educational officials. The local school-officers are known as school-boards, boards of school-directors, boards of education, school trustees or county superintendents. The method of selection, the powers and the duties of these school officers vary much in different states. However, it may be said that they act in general under the direction of a state-superintendent or a state-board of education and under the authority of the laws governing schools passed by the state legislatures. These laws usually prescribe what school-officers there shall be for each school, when and how and for how long and by whom they shall be chosen, the amount of school-taxes to be raised and the manner of raising these, the length of the school-year, the age of pupils, the qualifications of teachers, the subjects to be taught etc.

The important fact to be kept in mind here is that every public rural school is a *state* institution, organized and governed in accordance with the general laws of the state regarding public schools. Though in many instances the people of the community exercise a large influence in determining the character and policy of the school, they are obliged, nevertheless, to act and proceed in the manner prescribed by the laws governing the public schools of the state.

Support. The best definition of a public school is that it is a school deriving its support entirely or in part from moneys raised by a general state or county or other local tax. The principle that all property and all persons may be taxed for the support of public schools may be called one of the most firmly fixed beliefs of the American people, and one that has aided more than any other in the giving of opportunity for education to every American boy and girl. Rural schools as public schools, with very few exceptions, are supported wholly by public funds.

Each state has its own particular plan of providing money to support its public schools. In the main this money may be said to come from one or more of five sources or according to one of five methods: the local school-tax; the state school-tax; the income from the common-school fund; special licenses and fees; and special state aids and appropriations.

The local tax is that levied annually upon the taxable property in any school-district, township or county. The amount of the tax is fixed either by the people themselves, as in the case of many school-district organizations; or by such school-officers as school-boards, school-directors or school-trustees; or by other local officials, as boards of supervisors and boards of commissioners.

The state school-tax is a tax, regulated in amount by the state law, levied by the state officers upon the taxable property in the state and distributed to the different counties, townships or school-districts, generally, on the basis of the number of children of school-age residing therein. Other methods of distribution, as, for example, valuation of property, school-enrollment, school-attendance or the number of schools or teachers, are also used, singly or in combination. Sometimes, as in California, a special state-tax is levied for the benefit of high schools alone.

The permanent school-funds found in most states were formed principally from the sale and rent of public lands that had been set aside for school-purposes. The income on these funds is alone used for the support of the schools of the state, and this income is apportioned to the various schools of the state according to methods similar to those indicated above for the state school-taxes.

In a number of states special forms of revenue are used to aid in the support of public schools. Among these may be mentioned liquor and other business license-moneys, inheritance-taxes, poll-taxes, dog-taxes, certain classes of fines etc.

The last source of support that may be mentioned relates to the appropriations derived from the state treasury in the form of special aid to particular classes of schools, as high schools, manual-training schools, rural and semirural schools, and to schools for which the ordinary means of support are found to be insufficient. These special aids or subsidies, as they may be called, are employed in several states to raise the general standard of public education by stimulating the attendance of pupils and to encourage the people to establish and maintain efficient schools of the kinds indicated. The system of special aids to rural schools is found in but few states, as for example, Wisconsin, Minnesota, Indiana and in some of the more progressive southern states for the special purpose of securing better school-equipment; yet the signs of the times are that it will soon be more widely used to improve these schools and thereby equalize the educational advantages open to the children of the country districts. The most important problem of the rural schools throughout the whole country is the devising of ways and means to increase the amount of support, so that these schools may be placed on a par with the public schools of the villages and cities.

Teachers. No person is permitted to teach in any public school of any state without having first received a teacher's certificate, which may be obtained by passing a written examination or by completing a course of study at a high school, normal school or college. In almost all of the states of the Union one or more normal schools for the special training of teachers for the public schools exist as a part of the educational system. Certain states require that high schools shall give instruction in those subjects that will be of special value to teachers. This provision has a direct influence upon rural schools, because in very many cases the graduates of high schools become teachers in the rural schools. In addition to the high schools, normal schools and colleges, there are numerous institutions under private management with a similar aim. The supply of trained teachers furnished by the different high schools, normal schools and colleges scarcely more than equals the demands from the rapidly growing public schools of cities and villages. As a result of these demands, together with the better salaries and more attractive life in cities and villages, few trained teachers are found in the rural schools. Generally speaking, the great majority of rural school-teachers are young women without any special education to fit them for teaching beyond that provided in the schools they teach or, at the best, by a neighboring high school. In this respect the most of rural schools are not provided with teachers of sufficient skill and training to do the important work to be done. The low and insufficient salaries paid and the uncertainty of securing and holding a situation tend to make the rural teachers' position a hard one. Of recent years some of the more progressive states have established special county-schools for the training of teachers for the rural schools, and others, as Ohio, Pennsylvania, Indiana, Maryland, North Dakota and West Virginia, have also passed minimum-salary laws. Under these laws every public-school teacher must be paid at least a certain monthly salary ($40 to $45), and no board of education or school-district may pay a smaller sum. The question of obtaining trained and expert teachers is the second large and important problem yet to be solved.

Buildings. The old-fashioned, country school-house was constructed of logs, rough lumber, stone or, in some of the prairie-states, even of sod. It contained one oblong-shaped room, about 20 feet wide and 30 long, was heated by a fire-place or stove, and was furnished with rudely made desks and benches for the pupils. It was oft-times very poorly lighted and generally cold in winter and hot in summer. Very little was thought of ventilation and fresh air. Instead of being the best-built and neatest-looking building in the community and surrounded by well-kept grounds, it was more apt to be unpainted and dilapidated in appearance by its broken shutters and windows. In the larger number of cases it was located on the most exposed or least desirable piece of land in the district; hence the school-house surroundings were altogether barren except for the tangled growth of weeds that sprang up during vacations. As one drove through the country the school-house could frequently be picked out as the worst and most doleful-looking of all the buildings. Many of the farmers' barns looked neater and more inviting. Unfortunately many thousand country-school pupils still go to school in buildings of this kind.

However, a great change is taking place, and all over the United States new structures are being built for the rural schools, which are properly and sufficiently heated, ventilated, lighted, provided with furniture and apparatus for school-work and surrounded by shade-trees and neatly kept grounds. It is coming to be recognized that the "little, red school-house" of olden time lacked many things necessary to the health, comfort and progress of pupils and that the pupils of the rural schools are entitled to as good, healthful useful and beautiful school-buildings as the pupils of the village and city schools. To encourage the erection of better school-buildings in the rural sections a number of states now offer special aid in the way of additional funds. To provide against poorly constructed buildings it is becoming a common practice to require, before any rural school-building is erected, that the plans for it shall be approved by some competent county or state educational officer For the information of parents, teachers and school-boards many states have issued books of plans of model buildings and pamphlets giving in detail the requirements that should be fulfilled, that a child may attend school and not be under unhealthful conditions.

Improvement of Rural Schools. During the past decade many efforts have been made to improve the character of the rural schools; and at present these schools are receiving more attention from the people concerned and from educators, legislators and public men than ever before. That these schools deserve such widespread assistance and improvement is evident. In the main the rural schools are the weakest and least satisfactory, yet at the same time the most important, part of the American public schools. Though exact and reliable statistics are wanting upon the number and attendance of these schools, certain conclusions can be drawn indirectly. In 1905 there were approximately eighty-two and one half millions of people in the United States, of whom somewhat more than half lived in rural districts. During this year there were enrolled in all the public elementary schools of the country nearly sixteen million pupils. It is safe to assume that in the neighborhood of half of these sixteen million pupils attended rural schools. These eight million country-school children are entitled to an opportunity for a complete education equal in degree to that provided in the public schools of the cities and towns. The difficulties to be overcome are many, yet the following movements and reforms are well under way. The first results seem to indicate that the boys and girls who are pupils in rural schools are to have a chance to become really educated men and women, not educated away from the home and the farm but for the home and the farm.

English have come to denominate as secondary education, work in sciences, technology and art now given quite extensively as a supplement to the instruction in the elementary schools. In all these typical secondary schools the ordinary age of admission is nine or thereabout. Children are taught before this age in small private schools or by tutors. Very few go from the public elementary system into the secondary schools. The latter remain, therefore, as throughout history, the schools of the aristocratic and professional classes.

Here it is that the system of the United States has come to differ from that of Europe. For the secondary schools in this country are simply one stage in a continuous system. This result has come from gradual growth, for in the beginning American secondary schools were very much like those of Europe. In colonial days they consisted of grammar-schools, which had about the same purpose and curriculum as the English grammar-schools. Especially were they intended to prepare for college. Later they were largely superseded by the academies, which were under private control, although often endowed. These institutions became centers of educational life in various communities, and besides preparing for college better than grammar-schools had done, they constituted finishing-schools for most of those who attended them. Some of them grew into colleges. Their curriculum came to be much more liberal than had been that of the grammar-schools. English, including grammar and, later, rhetoric and literature, geography, natural philosophy, astronomy and, sometimes, chemistry and botany, algebra, geometry, trigonometry, surveying, navigation and history; and, later, modern languages and commercial branches, as well as the classics, were taught. The academies remain an important factor in the education of the United States, but they have been overshadowed by the high schools, the development of which is due to the growth of the idea that secondary education should be supported and controlled by the public. The first of these schools was established at Boston in 1621. Since then they have spread over all the Union, to-day numbering nearly seven thousand. They are supported and controlled by the local communities where they exist. Most of them are coëducational. The course of study usually takes four years, and pupils enter at about 14. As a rule the student may elect among several courses, which are denominated, according to the leading subjects of study in each, as classical, literary, scientific, Latin-scientific, modern-languages or commercial. In recent years there has been some agitation concerning the length of the high-school course. Some would have it cover six years, embracing the work of the last two years in the elementary schools. Others would have it encroach on the college; and graduate, high-school work is actually undertaken in some places, especially where the local facilities for college education are poor. The high schools have been compelled to do very efficient work in college preparatory subjects by the pressure of college demands. In many states, especially in the west — they are inspected by the university authorities, and, if found satisfactory, their graduates are admitted to the university without examination. Thus a system of inspection has grown up, the main one found in the United States for secondary schools. The complaint has become general, however, that high schools are dominated too much by the colleges, so that they aim merely to prepare for the latter and neglect the interests of that vast majority who do not go to college. To-day the tendency is for the high school to become more independent, even to the extent of compelling the college to accept *their* standards of graduation as qualifying for entrance. Many high schools have been organized to give technical or commercial education. In most cases, however, these schools have simply added the vocational training to a fairly liberal, secondary-school course. Future developments in secondary schools will doubtless comprise far more adequate provision for technical and trade education. In general it may be said that the high school is in a difficult situation, struggling on the one hand with its tradition of classical, disciplinary and aristocratic education and on the other with the democratic demand that it should provide a secondary education suitable for all, taking its students from an independent elementary system and coerced by the need of preparing them for college. It is coming to realize that the solution lies in more independence both in regard to tradition and to other schools. See Education, Modern; Mental Discipline; Schools, Elementary; and Universities.

E. N. Henderson.

Schools, Sum'mer. Schools of the Chautauqua type are held only during the summer months, at favorable resorts, and combine study with recreation, although opportunity is also offered for advanced instruction in special branches. Among summer schools and universities, that of the University of Chicago is unique in having the regular work of the entire university carried through the summer quarter. The universities allow credit towards a degree for work done during the summer session. Another important type of summer school is that for the professional training of teachers. There are also summer schools for the pursuit of some branch of natural sciences located at places suitable for their particular purposes.

School System at Gary, Ind. The rapid growth of Gary and the character of the population attracted by its gigantic industrial enterprises created an educational problem of uncommon difficulty. In the effort to provide suitable and sufficient educational facilities and have these keep pace with the needs of the city there has developed a school system having certain features which are essentially new. As is usually the case, this response to an emergency has taught lessons of value to schools everywhere, hence the widespread interest which this school system has aroused.

THE MAN WHO DEVELOPED THE SYSTEM

The man under whose leadership the system has been built up within the short period of seven years is Superintendent William A. Wirt. The essential features of the plan of organization and administration had been thought out by him and partly applied while he was superintendent of the schools at Bluffton, Indiana. The success of the plan there and its special fitness for conditions which would have to be met in the building of Gary led to his selection as the one best fitted to build its school system.

PROGRAM SHOWING HOW SIXTEEN CLASSES ARE ACCOMMODATED IN A BUILDING HAVING EIGHT ROOMS

REGULAR STUDIES		FORENOON		AFTERNOON	
Teachers	Rooms	90 Min.	90 Min.	90 Min.	90 Min.
First Grade	Classroom	1a	1b	1a	1b
Second Grade	“	2a	2b	2a	2b
Third Grade	“	3a	3b	3a	3b
Fourth Grade	“	4a	4b	4a	4b
Fifth Grade	“	5a	5b	5a	5b
Sixth Grade	“	6a	6b	6a	6b
Seventh Grade	“	7a	7b	7a	7b
Eighth Grade	“	8a	8b	8a	8b

SPECIAL ACTIVITIES									
Teachers	Rooms	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.
Music & Literature	Auditorium	1b	2b	1a	2a	3b	4b	3a	4a
Drawing & Man. Tr.	Basement	3b	4b	3a	4a	1b	2b	1a	2a
Music & Literature	Library	5b	6b	5a	6a	7b	8b	7a	8a
Nature Study	Basement	7b	8b	7a	8a	5b	6b	5a	6a
Three physical culture teachers and the Building Principal	Attic	2b	1b	2a	1a	6b	5b	6a	5a
	Playground	4b	3b	4a	3a	8b	7b	8a	7a
		6b	5b	6a	5a	2b	1b	4a	3a
		8b	7b	8a	7a	4b	3b	2a	1a

“UNIT SCHOOL PLANTS”

Best results, under this system, are attained in what are designated as “complete unit school plants.” It is essential that a “complete unit school plant” be located adjacent to or near a city park. The school building must be situated on grounds containing ten to twelve acres. Within the building, besides class-rooms, there must be an auditorium, gymnasiums, swimming pools, work shops, laboratories, studios, libraries, and all the facilities for comfort and convenience with which modern school buildings are now constructed. Outside the building there must be playgrounds and school gardens.

FOR ADULTS AS WELL AS CHILDREN

Thus situated and arranged, the “unit school plant” is a “complete” recreational as well as an educational center for a section of the city—for adults as well as children. In the daytime it is a “complete” school, having all of the grades—kindergarten, elementary, and high school. In the evening it is a “complete” center for social, recreational and continuation school purposes. On Saturdays it is a “complete” opportunity for voluntary work, play, and for pupils who need special help in order to keep up with their classes. In the summer time it is a “complete” center for vacation school purposes.

Ideal centers are represented by the Emerson and the Froebel plants. When operated in accordance with programs which are described below the capacity of these plants is 2700 pupils each in the day time and an equal number of adults in the evening. This capacity is secured by grounds and buildings of unusually generous porportions and by programs which utilize continuously every part of the building.

“REGULAR STUDIES” AND “SPECIAL ACTIVITIES”

The old program followed with various modifications in all schools which do not have large auditoriums, is so arranged that half of the pupils give half of each forenoon and afternoon session to “regular studies,” followed by an equal amount of time given to “special activities.” The other half of the pupils have the same program, but in reverse order. The “regular studies” are the formal language studies (reading, writing, spelling and composition), arithmetic, history and geography. The “special activities” are music, literature, drawing, manual training, nature study, physical training, play, vocational work, etc., varying in character and degree according to pupils' needs.

A CITY WITHOUT SPECIAL SUPERVISORS

The "regular studies" and "special activities" are conducted continuously throughout the day, by special teachers, on the departmental plan. There are no supervisors, as in other cities, aside from the superintendent and principals. The superintendent believes that teachers giving instruction in a limited number of subjects, for which they have been specially trained and selected, makes any overhead charge for their supervision, beyond that of the superintendent and principals, an unnecessary expense. Moreover, the character of the daily program, with the scheme for alternating classes in "regular studies" and "special activities," whereby all parts of the plant are used throughout the day, practically doubles the plant's capacity. Program on preceeding page shows how sixteen classes are accommodated in a building of a common type having eight class rooms.

The new program, now operated in the "complete" centers and requiring a large auditorium, is formulated in accordance with the following scheme:

HOW WORK OF PUPILS IS DIVIDED

The daily work of all pupils is divided into four different lines. One line of work is conducted in ordinary class rooms; a second in the shops, laboratories and studios; a third in the auditorium; a fourth in the gymnasium, swimming pools, play rooms or on the playgrounds. These lines of work are indicated below as Departments 1, 2, 3 and 4, respectively.

TABLE SHOWING HOW WORK IS DIVIDED

TIME	DEPARTMENT 1	DEPARTMENT 2	DEPARTMENT 3	DEPARTMENT 4
	Language Mathematics History and Geog.	N. Study and Man. T. Domestic Science Draw. and Music	Auditorium (Mass instruction)	Phys. Tr. Play Application
8:15 - 9:15	A	B	....	C D
9:15 - 10:15	B	A	C	D
10:15 - 11:15	C	D	A	B
11:15 - 12:15	D	C	....	....
12-15 - 1:30	A	B	....	....
1:30 - 2:30	B	A	D	C
2:30 - 3:30	C	D	B	A
3:30 - 4:30	D	C	....	A B

Four groups of pupils are simultaneously engaged in these four different departments throughout the day. For example, one group of pupils in Grades 1, 3, 5, 7, indicated as Group A above, is occupied with Department 1 of the first hour. A second group of pupils in Grades 2, 4, 6, 8, indicated as Group B, is occupied with Department 2. The third and fourth groups of pupils (Group C, Grades 1, 3, 5, 7, Group D, Grades 2, 4, 6, 8) are thrown together this first hour and are occupied with Department 4, this first hour, there being no exercises in Department 3 during this period. The second hour these four groups of pupils change departments and are engaged as shown in the diagram, and so on throughout the day.

For illustration we will limit ourselves to the work of pupils in the grades, although the same general plan of distribution applies, with necessary modifications, to pupils who are in high school.

With this simple arrangement two schools are accommodated in the same building, one school working in two of the departments while the other is occupied in the other two departments, alternately thus engaged throughout the day.

CHARACTER OF SPECIAL ACTIVITIES

In all grades the time assigned to Department 4 is divided between the teachers of physical training and play and teachers of subjects listed under Departments 1 and 2. In the lower grades teachers of mathematics, history, etc., use their share of this time, one hour, in games and constructive plays that apply the subject matter taught in the regular classes. This period is definitely planned to give the formal work of the school expression through self activity.

Music and literature teachers use the application period for folk dances, musical games, dramatization, modeling in clay and sand, and free play construction in the "busy corners" of the playground or play rooms. Nature study teachers use this application period in the care of lawns, trees, shrubbery, plants in the building and gardens, animal pets, etc. In the upper grades mathematics teachers use this period for practical measuring and planning of buildings, laying out playgrounds and spaces, and in practical accounting in connection with the clerical work of the school, and so on.

In the lower grades the occupations of the application period are based on the play impulse and are conducted out of doors, in the spacious corridors, or in the play rooms.

Observe that under the new program half the school is at lunch from 11:15 to 12:30, and the other half from 12:15 to 1:30, an arrangement which is very desirable where there is a large number of pupils in the building.

INTERESTING POSSIBILITIES OF THIS PROGRAM

There are many interesting possibilities under the new program. For example, one-half of the school (the C and D groups) or individual pupils in these groups, need not come to the building until 9:15, and the other half of the school (the A and B groups) or individual pupils in these, could be excused at 3:30, if this seems to be the most desirable arrangement for entire groups or for individual pupils. Again, a part of the time assigned to Department 4 could be utilized in other ways than those indicated. Classes in each group could give one period or more per week to religious instruction under the direction of the various churches or other religious organizations in the city. This plan is being tried by Superintendent Wirt as a means of solving the problem of religious instruction. Or, if desirable, the classes in each of the groups could spend one or more periods per week in the public library in charge of a regular teacher and a library assistant. This plan also is being tested. In such ways as these the purpose is to unite with the school all of the other available educational or recreational resources.

VOCATIONAL TRAINING WITH WORKMEN AS TEACHERS

The plan for vocational training in the Gary schools has attracted much attention, and consists in having a number of regular workmen selected on account of their upright character, intelligence, skill and teaching ability, engaged the year round in equipping and repairing the school plants of the city, pupils working with them in somewhat the same way as the old time apprentice. There are carpenters, cabinet makers, plumbers, sheet-metal workers, engineers, printers, electricians, machinists, foundrymen, etc., in sufficient number to meet the needs of the schools, and instead of employing a large number of these to put things in shape during vacations, as is done in other cities, this city, which has no long vacations, employs a small number and keeps them continuously engaged. Book-cases, cabinets, pupils' desks, benches, etc., are made, and these require staining and finishing. Some of the buildings or parts of buildings are to be painted inside and out, and there is always plenty of varnishing to do. Interior finish of buildings and desks and furniture have to be done over from time to time, and so on. The engineer of the heating, lighting, and ventilation plant gives lessons in firing, engineering, and ventilation. The electrician must care for many motors, lights, bells, clocks, etc., and here are opportunities for teaching and learning winding, motor construction, etc. The printing plant offers opportunities for both boys and girls in printing, making note books, repairing and rebinding of books, etc., and cuts for illustration, involving photography and photo-engraving, are to be made. Plumbing must be installed and kept in repair, and numerous parts of the school equipment call for the sheet metal worker. The foundry and machine shop are necessary, and these call for draftsmen to furnish plans and specifications. Moreover, in the purchase, care, and distribution of a great variety of supplies there is a laboratory for giving insight into commercial and business methods, calling for clerks, stenographers, bookkeepers, filing of correspondence, and making office reports, etc.

HOW "BUSINESS" BEGINS AT 8 O'CLOCK

As one observes the school in operation he discovers various special arrangements now to be mentioned. Arriving at the plant soon after 8 o'clock in the morning, the visitor will find that children are already to be found in every part of it. They are busy in playgrounds and gardens; they are hurrying to and fro in the corridors, as is the case at the time of passing from "regular studies" to "special activities" during the day. Since the same rooms are used by different groups in the evenings and on Saturdays, as well as during regular school day periods each pupil must have a locker where he may keep his belongings needed during the whole round of his daily occupation. Much of this passing, therefore, is occasioned by pupils returning things to the lockers or in taking from them something necessary for the exercise which comes next.

A PECULIAR KIND OF DESK

In some of the rooms used by pupils in the lower grades you find a peculiar kind of desk constructed by workmen in the industrial department with the aid of pupils. They are desks readily convertible into work benches, having detachable tops to serve as drawing boards. Instead of the usual type of seat attached to the floor or to the desk immediately behind it, each desk is provided with a substantial four legged stool, also made by the school, and this may be pushed under the desk when pupils do bench work.

A SCHOOL LIFE OVERFLOWING WITH EAGER ACTIVITIES

In the shops you will find pupils working at something in which they have become deeply interested. Or, if you glance into the auditorium several times during the day, you will find groups of children engaged in dramatization, singing, listening to the Victrola or piano player, looking at the stereopticon or moving pictures or attending to illustrated talks. In the corridors you find them studying and making notes on charts, maps, specimens, and other material exhibited there. In the laboratories some are working, others watching, older pupils "showing" the younger, or instructors conducting a regular class exercise Many girls in the advanced grades, aside from learning how to become intelligent home-makers, are occupied in the commercial and printing departments; some are at work in the arts and crafts; others in the school store and school bank, these two adjuncts being an actual business department, run according to strict business principles, to give reality to commercial studies.

In the "regular studies" you readily discover that in spite of departmental teaching, the various special teachers are doing team work. In a word, you find a correlation of studies and activities.

HOW MONEY IS SAVED UNDER THIS SYSTEM

The system provides for the better use of school buildings, making it possible to save large sums of money expended for this purpose, the buildings being so arranged that they may be used day and evening, including Saturdays, the year round. It would require considerable space to give the proof of this statement in detail, but it is clearly obvious that the erection of a number of unit plants, such as the Emerson and Froebel, is less expensive than the erection of a large number of buildings of the usual kind. The cost of building construction does not increase in proportion to the size of building, materials used and facilities offered remaining the same, to say nothing about the cost of fewer sites. Moreover, the establishment of school plants, so constructed as to utilize what is ordinarily waste space or space which is used only part of the time, according to a program which uses all parts of the buliding all of the time, makes it possible to double the plant's capacity. There is also a saving in expense for equipment by installing it in a few as opposed to many centers. Furthermore, the special activities under the new form of program are conducted in parts of the plant which are less expensive, on the average, than regular class rooms, and if there were not this alternation of classes engaged in regular studies and special activities, it would be necessary to double the number of regular class rooms, so that each pupil might have a desk and the use of a cloak room. It is equally obvious that the cost of operation and maintenance is decreased by having the necessary number of unit centers as compared with the usual practice elsewhere. The figures clearly show this. The expense per pupil for janitor service, principal, and for instruction, with the overhead charges for supervisors eliminated, is materially reduced.

The system also provides the possibility of a better division of time between the old and the new studies, spoken of throughout as "regular studies" and "special activities," and there is greater flexibility in adapting studies to exceptional children of all kinds, thereby doing away with the necessity of numerous special schools. The system also makes it possible to have more expert teaching by reason of its departmental plan of organization, while the better use of play time and the long school day prevents influences of the street and alley which undo the work of the school.

There is also more realism in vocational and industrial work when under the direction of expert workmen from the ranks of laboring men having charge of real shops, which pupils pass from day to day, and in which sooner or later they get their first lessons in some trade industry.

HEALTH, MORE RAPID ADVANCEMENT AND OTHER ADVANTAGES

It is also clear that the system has unsurpassed facilities for the promotion of the health of children, and the possibility of having pupils do work in more than one grade and of promoting them by subjects instead of grades, gives to this system an advantage over the traditional form of organization with its "lockstep" system of gradation and promotion. In this system there is also provision for pupils to help each other. The chasm between elementary and high school is destroyed, and dropping out of school at critical periods in the lives of pupils is prevented by the introduction, at such times, of subjects which appeal to awakening interests which are not satisfied by a continuous and exclusive devotion to the "common branches."

BETTER SALARIES AND FEWER PUPILS PER TEACHER

It is also clear that under this system it is possible to pay better salaries to teachers or reduce the number of pupils per teacher or both, and to bring together in a unitary way, with economy and efficiency in management, the other recreational and educational agencies of a city.

ADAPTATION TO OTHER CITIES

Buildings of the old type can, with varying degrees of success, be adapted to the new program, and the system as a whole is adaptable to other cities. The alteration of buildings demanded by the Gary program would practically double the school accommodations. Or, a city which already has class-rooms enough to care for all of the pupils, with a desk for each, could, by the adoption of the new plan, dispose of about one-half of its sites and buildings, the less desirable, of course, for more than enough to remodel and equip the remaining school facilities for use when operated under the program now followed at Gary in the complete unit school plant. A change to this system would involve a reassignment of teachers according to the departmental plan. Some of them, if retained in the service, would have to enter upon courses of training for some special work according to individual interests and aptitudes. Some unfitted for working in the new spirit would have to be retired. The number of principals would be diminished; supervisors would become teachers of special activities in centers, giving all their time to this work instead of spending much of it in going from building to building, breaking into programs of class room teachers at all hours of the day, and giving lessons while regular class room teachers look on. Thus reorganized, these centers would become fitted for the wealth of opportunities afforded by the Emerson and Froebel school plants; not so well suited as plants originally designed for such opportunities perhaps, but, nevertheless, well adapted to these ends.

William P. Burris.

Schools for Defectives. The course of modern education in the teaching of defectives furnishes an admirable illustration of the law first emphasized by Spencer in his classic essay on "Progress"—the germ and beginning of his great elaboration of the evolutionary process. He points out that every cause produces more than one effect. And "every tree bringeth forth fruit after its kind"—the good tree good fruit, the evil tree evil. As a consequence when you start out to accomplish one good object you inevitably—if you succeed—accomplish more than one.

ORIGIN OF THE MONTESSORI METHOD

In accordance with these laws of growth it was in her work in an institution for the feeble minded that Dr. Montessori (*q. v.*) unconsciously began the development of the remarkable system of education which bears her name and which seems destined to hasten such vital changes in our teaching methods.

HOW DEFECTIVES ARE CLASSIFIED

Defectives include the deaf, blind and feeble-minded or idiotic. It is only within 60 or 70 years that much attention has been given to their education, but in special schools in this country and in Europe the majority become self-supporting—particularly the deaf and the brighter ones of the feeble-minded.

EDUCATION OF THE DEAF AND THE BLIND

In the case of the deaf the chief difficulty is to teach them the use of language without the aid of sound. For this purpose the three chief methods that have been used are that of *sign-language*, in which a separate sign is made to represent each different object or idea; that of the *manual alphabet*, in which our ordinary letters are symbolized by signs made on the fingers; and *the direct, intuitive or oral method*, in which the pupils learn to understand oral language and to speak it by watching the movements of the teacher's lips in speaking and by imitation of the movements of the vocal organs. The oral method is difficult, but in many cases excellent results have been secured by it. Most schools use a combination of several methods. Among private schools for the deaf the Wright-Humason School in New York is one of the best.

The first American schools for the blind were those of New York, Boston and Philadelphia, established about 1833, in each instance through private capital and enterpise. It is very important that the teaching of blind children should begin at an early age, lest the natural development of the mind be hindered through lack of activity Here, also, various methods of teaching have been employed. Reading from embossed print has now been largely superseded by an alphabetical system of dots instead of letters, devised by the blind themselves This system is easier to read by touch and easier to write than the letter-system. Recent inventions have made possible the rapid production of whole libraries for the blind in this latest *braille* system. The National Printing House for the blind at Louisville, Ky., keeps a large supply of books on hand. The task of teaching the blind is much easier than that of teaching the deaf and dumb.

There have been some remarkable instances of the successful teaching of the deaf-blind, particularly the cases of Laura Bridgman and Helen Keller.

Of the feeble-minded there are all varieties and gradations, and some can be helped or entirely cured by proper surgical treatment. They should always be separated from the insane. Some are incapable of much instruction and cannot be made self-supporting. In general the feeble-minded person lacks initiative and con trolled and purposive action. Industrial and kindergarten training are each found very valuable for all classes of defectives.

Schools of Com'merce. Commercial education in the United States is conducted by four classes of institutions: private business and commercial schools; public high schools; endowed schools, which often have an industrial as well as a commercial bias; and colleges and universities. The need for special commercial education increases with the complexity of modern business methods. It is felt in the secondary more than the primary school. Elementary education is much the same for all: but the secondary school may tend to prepare exclusively for the college and not for a business vocation. The need of secondary commercial schools was met by their establishment in Vienna as early as 1754, in Brussels in 1834, Trieste 1877, Leipzig 1898, Aix-la-Chapelle 1900, Cologne 1901, Frankfort 1901, Milan and Lorraine 1902. In 1904 the enrollment at Cologne showed 778 students, at Frankfort 546 and at Leipzig 395. A higher commercial school opened at Tokio, Japan, in 1885; and another at Kobe in April, 1903. Japan also has commercial schools graded A and B according to the difficulty of the curriculum. In 1904 there were 48 of these schools, at which children of an age of not less than ten years, provided that they have finished a four-years' course in the ordinary primary schools, are allowed to attend. In Germany there not only are commercial schools, such as have been mentioned, and *realgymnasien* in which modern subjects are emphasized but even commercial universities at Aix-la-Chapelle, Frankfort, Cologne and Leipzig. These universities have 2,841 students, of whom 1,015 are matriculated. In American colleges and universities in 1904 there were 1,537 regular students of commerce in all. Courses in commerce were attended by 6,835 men and 5,430 women

The report of the Commissioner for Education in the United States in 1904, founded upon information received from 4,602 different institutions, shows that for the scholastic year 1903–04 there were enrolled 250,231 students in business or commercial studies. This was an increase of 6,710 over the preceding year. The regular business-schools had an enrollment of 138,363; the public high schools had 85,313 in business-studies; the private high schools and academies had 13,479; the normal schools 3,255; and the universities 9,821 students in commercial branches. These numbers may give an exaggerated impression of the efficiency of commercial education in the United States, for it is to be recollected that many of the students included may have studied one business or commercial subject only, and that as an extra. American private business and commercial schools were in the field early in the 19th century; they, however, are generally small and utilitarian in their aim. Public high schools endeavor to maintain broader educational aims; and are usually content to offer courses in bookkeeping, typewriting and stenography as electives. Separate high schools of commerce exist and are successful in New York City and Washington, D. C. Several high schools offer a commercial course which may extend over one, two, three or four years; for example, some of the high schools of Boston, Pittsburgh, Omaha and Philadelphia. Among the more important, endowed, secondary institutions which carry on commercial education should be mentioned Pratt Institute, Brooklyn, and Drexel Institute, Philadelphia. About one hundred normal schools invite commercial students. Colleges of commerce have been established in the universities of Pennsylvania, California, Chicago, Dartmouth, Illinois, Michigan, Wisconsin, Louisiana, Vermont, West Virginia, Nevada and Wyoming. See Dexter's *History of Education in the United States*, pp. 415–23.

Schoon′er. See Ship.

Schopenhauer (*shō′pĕn-hou′ẽr*), **Arthur,** a German philosopher, was born at Dantzic, Prussia, Feb. 22, 1788. He studied at Göttingen, Berlin and Jena, hearing Fichte and Schleiermacher. From Weimar, where his mother resided, he went in 1814 to Dresden and from there to Italy, afterwards living at Berlin and Frankfort-on-the-Main. His chief book, *The World as Will and Idea*, gives a large part of his peculiar philosophy. *On the Will in Nature* and *Sight and Colors* are among his philosophical writings, which include many occasional papers and his prize-essay in the Norwegian Academy on *Freedom of the Will*, which brought him the first public praise. He died on Sept. 21, 1860. See *Lives* by Zimmerman and Wallace.

Schreiner (*shrī-nẽr*), **Olive,** whose pseudonym is Ralph Iron, was born about 1860 in Basutoland, South Africa, where her father, a German Lutheran clergyman, was a missionary in the service of the London Missionary Society. Her mother, however was an English woman. In 1894 she married S. C. Cronwright. In 1883 she published *The Story of an African Farm*, a story of Afrikander life, replete with simple but forceful and fascinating pictures of South Africa and its peoples. *Dreams*, *An English South African's View of the Situation* (1899) and *Trooper Halket* are other publications of hers. Her husband and she also were joint-authors of *The Political Situation* (1895). Her judgments as to this and as to the Transvaal difficulties were those of one who, though half English, appreciated and sympathized with the native Dutch of South Africa. Her home was at Hanover, Cape Colony. She died in 1920.

Schubert (*sho͞o′bẽrt*), **Franz Peter,** a celebrated musical composer, was born at Vienna, Jan. 31, 1797. Before he was 11 years old he was singing in a church-choir, and was soon sent to the chorister's school of the court-chapel, where he became leader of the school-band. *The Erl King*, his immortal song, was composed when only 18, and the *Mass in F* while teaching in his father's school at Lichtenthal. In 1819 one of his songs, *The Shepherd's Lament*, was given at a concert at Vienna, and his comic operetta, *The Twins*, was produced at the theater there. As his songs became known, the enthusiasm with which they were received made publishers ready to accept his manuscripts, and as many as 20 songs were published in eight months. He made a tour with Vogl in 1825, delighting everyone with the performance of Schubert's seven songs from the *Lady of the Lake*, though the songs were afterward sold for only $100. He gave his first and only concert in Vienna in 1828, which was so successful as to put the needy composer, who had been selling some of his best songs at a penny, beyond want for a time. His musical productions are very numerous, as he wrote rapidly and steadily, sometimes composing six or seven songs in a morning. Everything he saw, heard or read suggested a subject; one of his piano-duets was inspired by the song which he heard sung by a Hungarian girl as he passed the kitchen door, and his *Hark! Hark! the Lark* flashed over him in a beer-garden. His songs are among his finest work, Beethoven, who saw them only on his death-bed, saying: "Surely Schubert has the divine fire." His compositions include more than 500 songs, ten symphonies, six masses, several operas, cantatas and a host of sonatas. He died on Nov. 19, 1828 See *Life* by Frost.

Schumann (*sho͞o′män*), **Robert,** a German musician, was born at Zwickau in Saxony, June 8, 1810. He began his musical studies in Leipsic, and in his haste, besides constant practicing, tried some mechanical means for increasing the power of his hands, which resulted in a permanent injury to the right hand and compelled him to turn his attention to composition. For ten years he edited a musical journal, composing at the same time some of his best pianoforte works. Mendelssohn's coming to Leipsic in 1835 resulted in making it the musical center of Germany, and Schumann at once was one of his worshipers. His last years, in which he produced some of his best works, as the *Quintette* for pianoforte and strings, *Paradise and the Peri*, *Genoveva* etc., were clouded by brain-trouble, ending in insanity. The last two years of his life were spent in a private asylum near Bonn, where he died on July 29, 1856. His wife, a fine pianist, labored incessantly to have his works acknowledged, performing them in the chief cities of Europe with gratifying success. She lived to see him ranked among the great composers. See *Life* by Wasielewski.

Schumann-Heink, Ernestine (1861), a noted German contralto singer (family name Roessler), was born at Lieben, near Prague. A pupil of Marrietta Von Leclair, with whom she studied at Gratz, she afterwards made her début at Dresden in *Il Trovatore*, and appeared also at Hamburg and at Baireuth, where she sang in opera and especially distinguished herself in *Der Ring Des Nibelungen*. In 1883 she married Herr Heink, and ten years later she became the wife of Paul Schumann. In 1898 Mde. Schumann-Heink came to this country, where she became a favorite, alike of audiences and musical critics, for her singing both in opera and at concert.

Schur'man, Jacob Gould, American educator, president of Cornell University, was born at Freetown, Prince Edward Island, Canada, May 22, 1854, and was educated at Acadia College, Nova Scotia, graduated at London University, and pursued his studies at Paris and at Edinburgh, Scotland. He also took special courses at Heidelberg, Berlin and Göttengen, and on his return to Canada became professor of philosophy and English literature in two of the colleges of the Canadian maritime provinces. In 1886 he was appointed Sage professor of philosophy and dean of Sage School in connection with Cornell University. In 1892 he became president of Cornell, and at the same time edited *The Philosophical Review* and *The School Review*. In January, 1899, he was nominated by President McKinley as chairman of the Philippine commission, and given temporary leave of absence from Cornell. He is the author of *Kantian Ethics, Ethics of Evolution, The Ethical Import of Darwinism, Belief in God, Agnosticism and Religion, The Genesis of the Critical Philosophy, Philippine Affairs* and *Retrospect and Outlook*.

Schurz, Carl, was born in Liblar, Germany, near Cologne, March 2, 1820. His father was the schoolmaster of the village and was eager to give his boy as good an education as his frugal means would allow. He attended the gymnasium at Cologne, and though compelled for financial reasons to leave before graduation, he succeeded in gaining entrance at the University of Bonn at 17. While at Bonn he came under the influence of Gottfried Kinkel, a professor of literature and rhetoric, who was earnestly devoted to the revolutionary movement of Europe. Under his influence he took part in the German revolutionary movement of 1848. When this collapsed, Kinkel was condemned to life-imprisonment at hard labor and Schurz very narrowly escaped and concealed himself in Switzerland. Schurz could not rest until he had, by an almost unequalled feat of daring and skill, liberated his former instructor. He then fled to England where he remained for a short time, afterwards going to France. He kept in close touch with the revolutionary movement, and was a personal friend of Mazzini and Kossuth. In 1852 he came to America and for fifty years played an important rôle in American political affairs. He was an officer in the Union army, and in recognition of his worth Lincoln made him ambassador to Spain. He soon resigned, however, to take a more active part in the war. He was promoted to major-general and took part in the battles of Second Bull Run, Chancellorsville, Gettysburg and Chattanooga. He entered journalism after the war and in this field won great distinction. Mr. Schurz was editor of *The New York Evening Post* and a contributor to *Harper's Weekly*. He was senator from Missouri (1869–1875) and secretary of the interior during Hayes' administration (1877-81), and always was an ardent supporter of the Republican party until it began to take up what seemed undemocratic principles. Mr. Schurz always was a strong supporter of Civil Reform, and was made president of the National Civil Service Reform League from 1892 to 1901. After the Spanish War he was one of the strongest opponents of the imperialist policy. As a political orator he exerted great influence. Most important among his publications are his *Life of Lincoln, Henry Clay* in the American Statesmen Series, *Eulogy on Charles Sumner* and his *Autobiography*. His death occurred on May 14, 1906.

Schuyler (*skī'ler*), **Philip John,** an American general, was born at Albany, N. Y., Nov. 22, 1733. He served in the French and Indian War, was a member of the colonial assembly from 1768 and of the continental congress of 1775, and one of the first four major-generals of the Revolutionary army. He was preparing to invade Canada as head of the northern department of New York, when his health obliged him to give up the command to General Montgomery, and in 1770 he resigned his office, though remaining one of Washington's most trusted advisers. He made treaties with the Six Nations, and was state senator for 13 years, United States senator for two terms and surveyor-general of the state from 1782. He was one of the leaders of the Federal party in New York, and helped to prepare the state's code of laws. He died at Albany, Nov. 18, 1804. See *Life* by Lossing and *Philip Schuyler* by Schuyler.

Schuylkill, (*sköl'kĭl*), a river of Pennsylvania, rising in the coal-region near Pottsville and flowing 130 miles southeast into the Delaware at Philadelphia, to which it furnishes its water-supply. Coal-barges ascend the river by the help of dams and locks.

Schwatka, (*shwôt'kä*), **Frederick,** an American arctic explorer, was born at Galena, Ill., Sept. 29, 1849, and died at Portland, Oregon, Nov. 2, 1892. In 1871 he graduated from West Point, receiving a commission as lieutenant of cavalry in the United States army, which he resigned in 1884. Early in his career he became interested in arctic exploration and in the fate of Sir John Franklin. In 1878 he joined an expedition for King William's Land. This party returned two years after, having discovered and interred many of the skeletons of Franklin's crew and, in some degree, solved the mystery of that explorer's fate, bringing home interesting relics of Franklin's outfit. On this expedition the party made a sledge-journey of over 3,250 statute miles — the longest on record. Later Schwatka explored the course of the Yukon in Alaska, and in 1886 he commanded the New York *Times* Alaskan expedition and ascended Mt. St. Elias 7,200 feet. He sought also in northern Mexico for remains of Aztec civilization. He published *Along Alaska's Great River*, *A Nimrod of the North*, *Children of the Cold*, *The Franklin Search*, etc. See Gilder's *Schwatka's Search.*

Sci'ence, To know a truth in its relation to other truths is to know it scientifically. For example, when one understands that the change of night and day depends upon the apparent daily motion of the sun, he has mastered a scientific truth which thinking-minds have known from time immemorial. By summing up every-day experiences like this man has been led to the belief that natural events follow each other in an orderly and connected way. To investigate this orderly connection is the aim of all science. The method in use is called the scientific method, and is that of observation and experiment. In this way great laws are deduced, or thought to be deduced, for history shows that the scientific beliefs of one age are time and again overthrown by the scientific discoveries of a later age. Great principles which lie at the foundation of all science have, however, been certainly determined, and especially have great advances in scientific knowledge been made in the last century. The different divisions of science have been grouped in different ways by Comte, Herbert Spencer and others. The most general division is into physical sciences, which have to do with matter and force; biological sciences, which consider the laws of life; and psychical sciences, which deal with the phenomena of the mind. Religion, agriculture, politics and art, as truly are sciences as are geology and astronomy. But science is often used popularly to mean the physical sciences alone. See Jevons' *Principles of Science.*

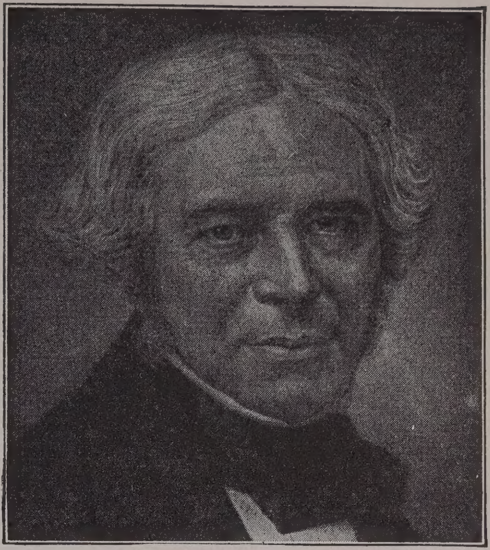
Scil'ly Islands, a group on the southwestern coast of England, 27 miles southwest of Land's End. There are six large and about 30 smaller islands, and many rocks and ledges. Tin is found in small quantities. Athelstan conquered the islands in 938, and put some monks on Tresco, where are still seen the ruins of their abbey. Queen Elizabeth leased the islands to Sir Francis Godolphin, in whose family they remained for 250 years. The star-castle on St. Mary's island was built by him, and the village of Dolphin on Tresco owes its name to the family. In 1834 they were leased to Augustus John Smith and in 1872 to his nephew. There are lighthouses on several of the islands, but wrecks were formerly common, one of the most noted being that of Sir Cloudesley Shovel's fleet in 1707, when 2,000 men were drowned. The principal industry is the cultivation of the narcissus and other lilies, 100 tons of flowers being shipped in a single spring. The mackerel-fishing in May and June is extensive, a daily steamer carrying away a cargo of 100,000 fish. See White's *Week in the Isles of Scilly.*

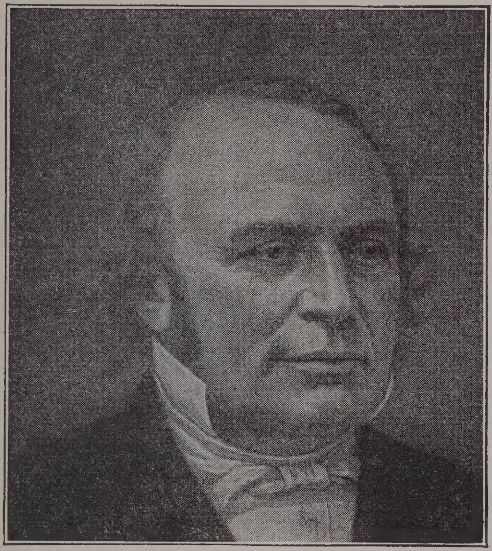
Sciop'ticon, See MAGIC-LANTERN.

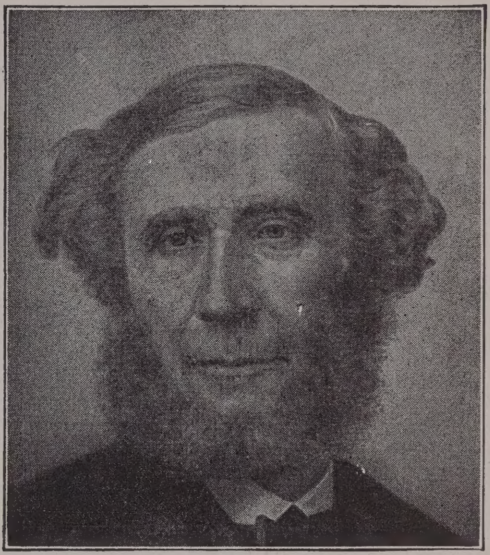
Scioto, (*si-ō'tō*), a river in southern Ohio. It rises in the northwest of the state, flowing east and south to the Ohio, which it enters at Portsmouth. It is 300 miles long, and is a feeder of the Ohio and Erie Canal.

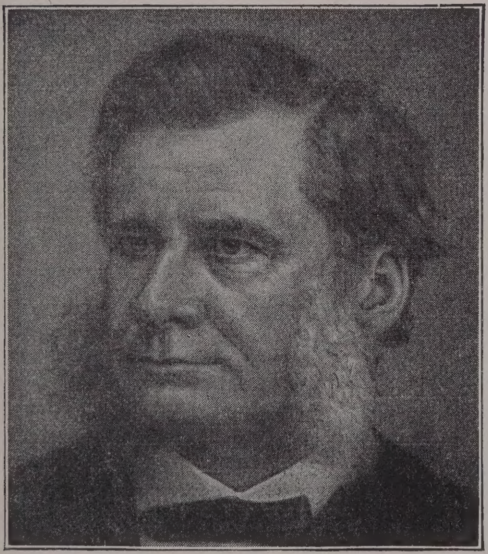
Scipio, (*sĭp'i-ō*), **Publius Cornelius,** called Africanus Major, a Roman soldier, was born in 237 B. C. He saved his father's life at the battle of Ticinus (218) and was also in service at Cannæ. He was so popular that he was elected to the Roman office of *aedile* before he was of legal age, and was chosen a "general extraordinary" for Spain by acclamation, a choice which his victories in that country, which gave the whole state to the Romans, proved wise. He succeeded in having the war carried into Africa, thus compelling Hannibal to leave Italy, and defeated him at Zama, Oct. 19, 202, thus ending the long struggle between Rome and Carthage. He was received in triumph at Rome, the title of Africanus given and the positions of consul and dictator for life offered, which he refused. With his brother he won the great victory of Magnesia over Antiochus, and when his brother was prosecuted for receiving bribes from Antiochus and condemned, he rescued him from prison.

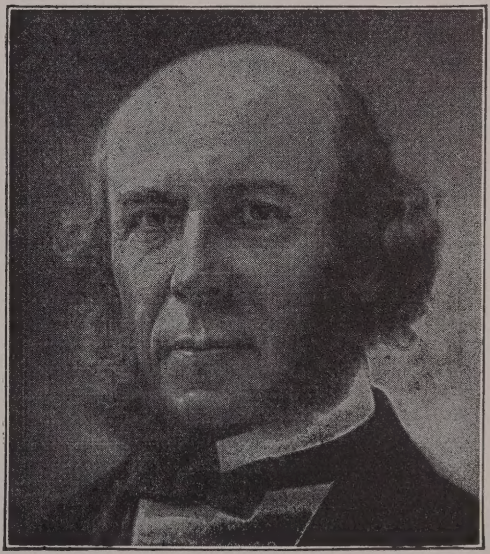
Sir Humphry Davy


Michael Faraday

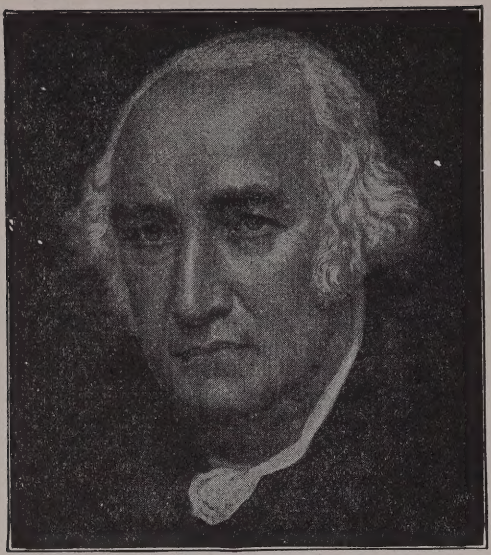

Louis J. R. Agassiz


John Tyndall

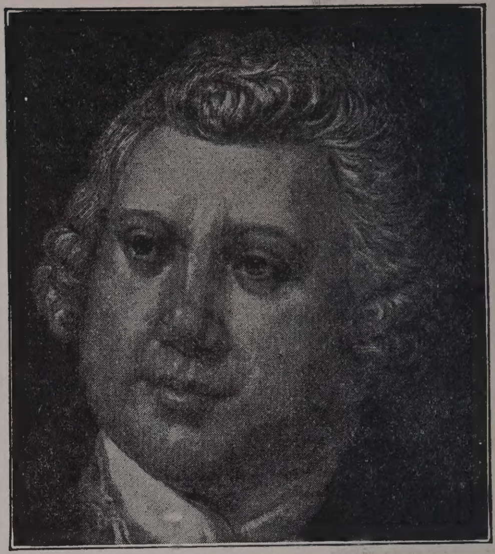

Thomas H. Huxley


Herbert Spencer

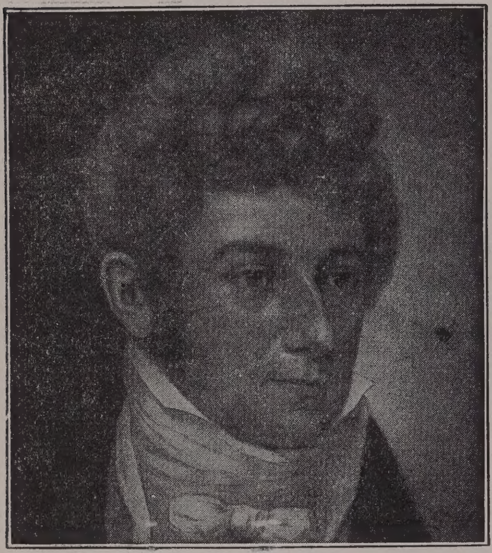
GREAT SCIENTISTS



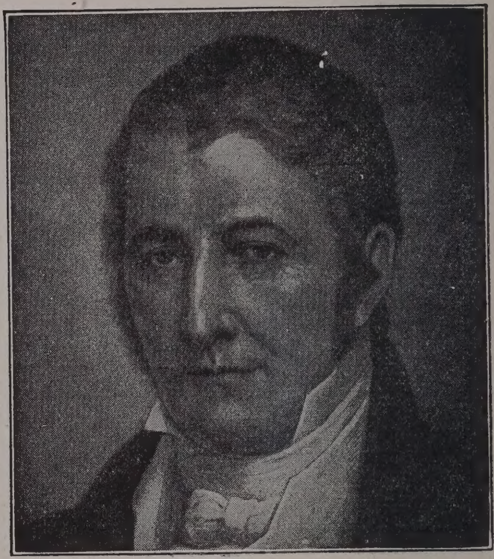
James Watt



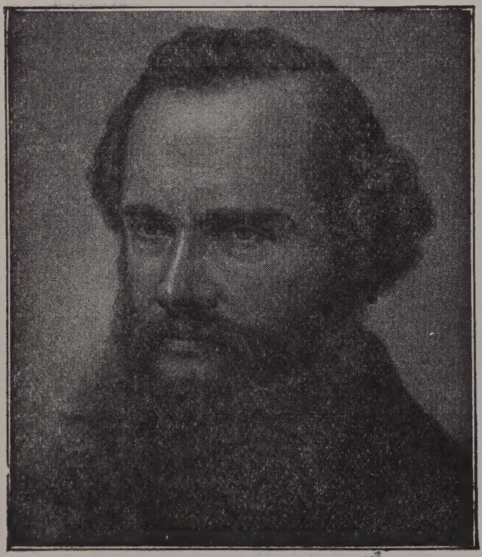
Sir Richard Arkwright



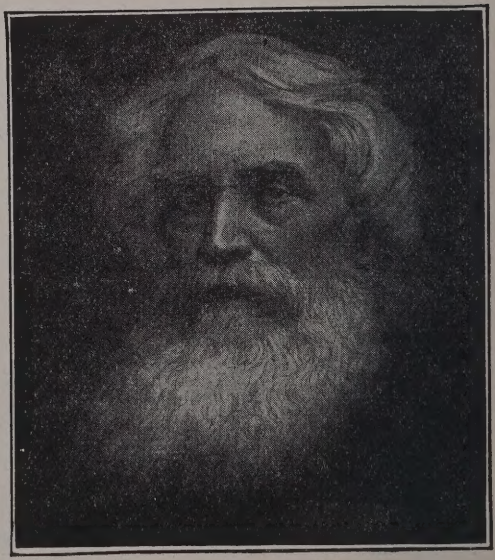
Robert Fulton



Eli Whitney

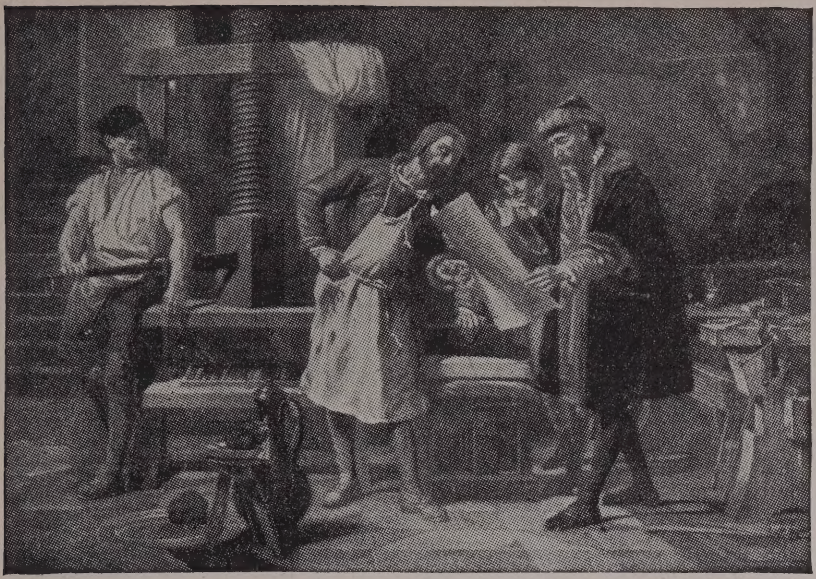


Sir Wm. Thompson (Lord Kelvin)

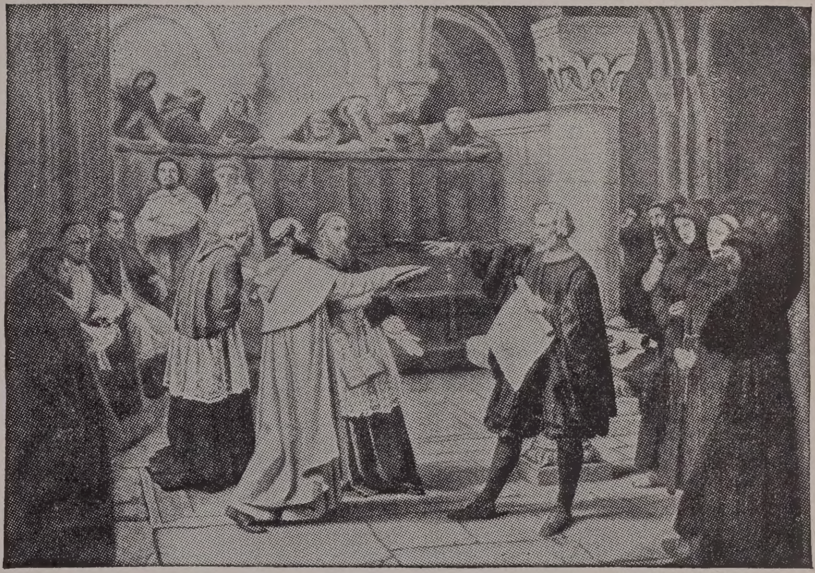


Samuel F. B. Morse

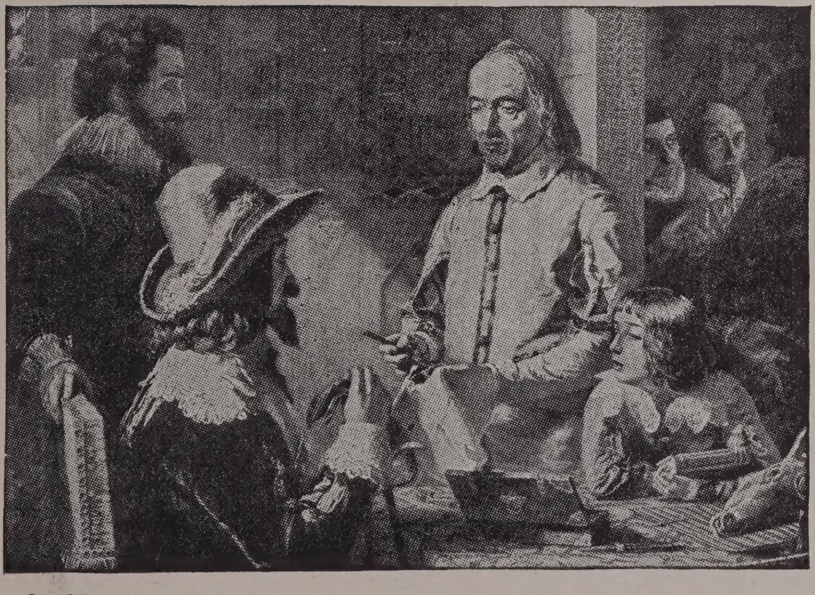
GREAT INVENTORS



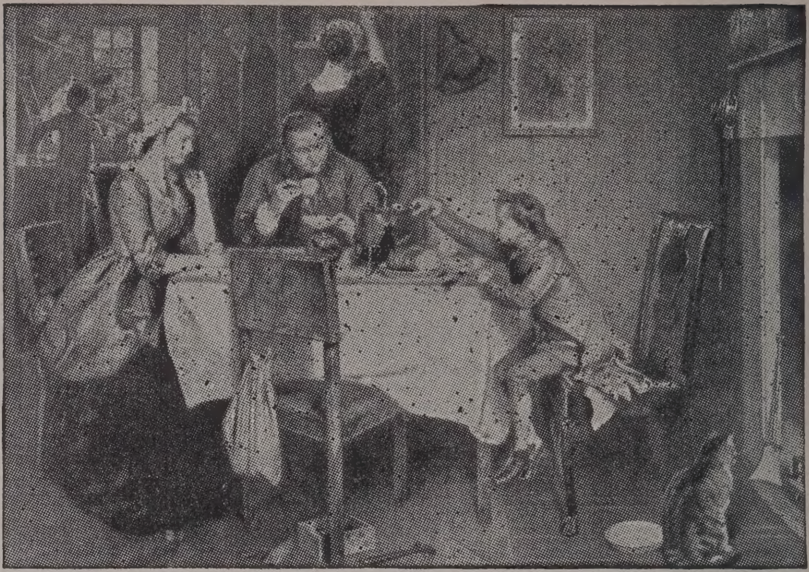
HANS GUTENBERG (1400-1468) in his workshop at Strasburg, Germany, showing the result of his invention—printing on parchment from movable wooden types. Each letter of the alphabet was carved in relief on one side of the type, bored with a small hole and strung.



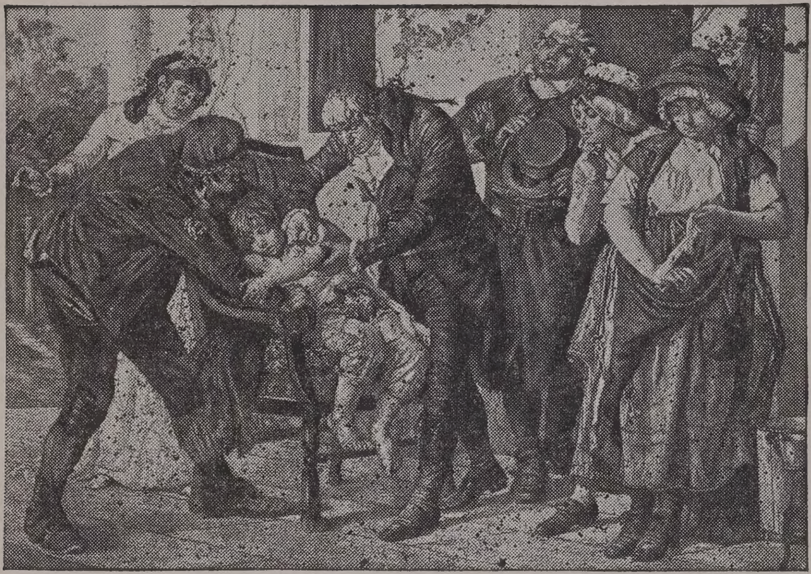
GALILEO—GALILEI (1564-1642), the great Tuscan astronomer whose discovery of the telescope led to his trial before the Inquisition in Rome. His discoveries in the theory of motion, in the laws of falling bodies, and the motion of projectiles laid the foundation for modern physics.



WILLIAM HARVEY (1578-1657), an English physician, demonstrating his theory of the circulation of the blood, one of the most important known laws of animal nature.



JAMES WATT (1736-1819), the Scotch inventor, is making a youthful experiment with spoon and kettle in the condensation of steam. His inventions were many but it is upon his steam engine patents that his fame rests.



DR. EDWARD JENNER (1749-1823), the discoverer of vaccination, was born in Berkeley, Gloucestershire, England. He is here seen vaccinating a small boy with virus from the hand of a milkmaid.

DR. LOUIS PASTEUR (1822-1895) was born in Dôle, France. His passion for chemistry led to his discovery of the germs of disease and their conversion into vaccines.

Later, charges were brought against Scipio himself, which he did not deign to notice, but on the first day of his trial told the story of his victories, and on the second day reminded the people that it was the anniversary of the battle of Zama and a time to give thanks to the immortal gods. In the popular excitement that followed the prosecution was ended. His daughter was Cornelia, the mother of the Gracchi. He died at his country seat in Campania about 183 B. C.

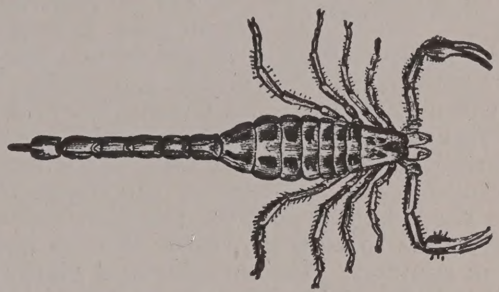
Scipio, Publius Cornelius, called Africanus Minor, was born 185 B. C. He was the son of Lucius Æmilius Paulus, the conqueror of Macedon, but was adopted by Publius Scipio, a son of the great Scipio. He fought with his father at Macedon, went to Spain as military tribune, and in 149 B. C. laid siege to Carthage. He was elected consul in 147. In 146 he took Carthage by storm, and obeyed with sorrow the harsh order of the senate to raze it to the ground and plow its site. As he gazed on the ruin, the thought of the possible destruction of Rome flashing over him, he quoted the words of the *Iliad:* "The day shall come when sacred Troy shall perish, and Priam and his people shall be slain." In 142 he was censor, 139 an ambassador to Egypt and Asia, and in 134 he was re-elected consul. The contests in Spain tried the best skill of the Roman generals, until in 134 Scipio was sent to Spain, and, after an eight months' siege of Numantia, destroyed the city. In the political troubles at Rome Scipio angered the reform party by interfering for the Latins whose lands were being seized in the haste to carry out a new measure, and he was found dead in bed in 129 B. C., doubtless murdered by some member of the party.

Sclerenchyma, (*sklē-rĕn'ki-mă*) (in plants), a tissue whose cells have walls uniformly thickened. These cells usually are more or less elongated, and a common form is fibrous. Sclerenchyma is a mechanical supporting tissue and is generally developed wherever strength is needed. It is very commonly associated with the vessels, forming the so-called fibers of the fibrovascular bundles. It is also frequently developed in the cortex, either in strands or in bands.

Scol'lard, Rt. Rev. D. J., Bishop of Sault Ste. Marie, was born in Ennismore, Ontario, Nov. 4th, 1862. He entered St. Michael's College, Toronto, in November of 1882; was class-leader during his whole classical course, taking Elmsley Scholarship in 1885 and Campbell Classical Medal in 1886; and graduated with honors in 1887. He entered Sulpician Grand Seminary at Montreal in September, 1887, became bachelor of divinity in 1889 and obtained the degree of licentiate in sacred theology in 1890, and graduated in December, 1890. He was ordained on December 21st, 1890, appointed assistant-priest at St. Peter's Cathedral, Peterboro, Ontario, in 1891, and made bishop's secretary and chancellor of the diocese of Peterboro in April, 1893. He was appointed pastor of St. Mary's Church, North Bay, Feb. 16th, 1896, and was in charge of this parish until appointment as bishop of the new diocese of Sault Ste. Marie on Sept. 21st, 1904. He was consecrated bishop on Feb. 24th, 1905.

Scone, (*skōōn*), a town in Scotland, two miles north of Perth, on Tay River, celebrated as the place where the Scottish kings were crowned from 1153 to 1458. The Stone of Destiny, on which the kings were seated, was carried off in 1296 by Edward I. See Urquhart's *History of Scone.*

Scor'pion, the common name for any member of the natural order of jointed animals called *Scorpionida.* These animals are united into a class with the spiders. They have long, slender bodies and resemble in a general way the small lobster. The head and thorax are joined into a single division, but the long abdomen is plainly jointed. It is divided into two portions: a broad part of seven joints and a more slender, tail-like part with five joints. The latter is terminated by a sting, and is carried arched over the back of the animal. The thorax bears four pairs of walking-legs. The most prominent appendages are the pedipalps, which extend forward and end in broad claws. Scorpions are restricted to warm countries. They range in length from two to eight inches. Small kinds are common in the southern portion of the United States. During the day they lie concealed under stones and in holes, but they are active at night. Their food is insects, spiders and other small animals. They are able to inflict a severe wound with their sting, but it is rarely if ever fatal.



SCORPION

Scot'land, is one of the political divisions forming the British Empire, and is the northern part of Great Britain, surrounded by the ocean on all sides except the south, where it touches England. It is 274 miles long and from 24 to 146 miles wide, including 29,796 square miles, which makes it about as large as Indiana. The coast of 3,000 miles is deeply indented, so that very few places are more than 40 miles from the sea, and there are 186 islands, mostly in the

Hebrides, Orkney and Shetland groups. Solway Firth, Liddel and Tweed Rivers and Cheviot Hills separate Scotland from England. The rivers, flowing mostly to the sea, are not large, the Clyde of 106 miles being the longest. The Tweed, Forth, Tay and Dee are well-known, as are also the beautiful fresh-water lakes of Loch Lomond, Loch Katrine, Loch Leven etc. The division of the country into Highlands and Lowlands is rather a division of race than of country, for, though the Highlands include the more mountainous parts of the country, they have rich, level tracts, while there is hardly any part of the Lowlands without mountains. The Highlands are that part of the north and northwest of Scotland where the Celtic language and customs still linger, and include the Hebrides, but not the Orkneys and Shetlands, where the people are of Norwegian origin. There are nearly 200 mountain-peaks in Scotland over 3,000 feet in height, the highest being Ben Nevis, 4,406 feet. The northern Highlands, the Grampians and the Cheviot Hills, with their beautiful glens and mountain lakes make the famous scenery of Scotland. The nearness of the ocean tempers the climate, so that the thermometer rarely falls to zero in winter or rises above 80° in summer. The animals and plants resemble those of England. About half of the birds are waterbirds, and fish, especially shellfish, abound. The country is not well-adapted to agriculture, because of its cool summers, late springs and heavy rains, but it is carried on with great care and the use of the most improved methods; and in the wildest mountain-regions sheep graze. The fisheries form an important industry, especially the salmon, herring, cod and ling. The salmon is so abundant that before it was sent to England in large quantities, servants used to make a condition that they should not be fed upon it more than three times a week. The principal minerals are coal, iron known in the United States as Scotch pig, lead, granite, sandstone and other fine building-stones. The linen, cotton and wool manufactures are large, and there are silk, hemp, hosiery, hats, leather and soap factories and large breweries and shipyards.

Scotland, since its union with England, sends 16 peers to the house of lords and elects 72 members to the house of commons. It has its own courts and its state religion, which is Presbyterian. Its common-school system, going back to 1695, made the Scottish people of the 18th century the best educated in Europe. There are four universities, Glasgow, Aberdeen, Edinburgh and St. Andrews.

The early inhabitants were the Picts, a collection of Celtic tribes, and by the Romans the country was called Caledonia. The Scots were a tribe from Ireland, then called Scotia, who settled on the western coast of Caledonia, and the kingdom of the Picts and Scots seems to have been first called Scotland in the 10th century. There are 38 Pictish kings mentioned in early Scotch history. The Saxons settled in the lowlands in 449, and one of their leaders, Edwin, founded Edinburgh (Edwin's burgh). The introduction of Christianity into Scotland by Irish missionaries dates back to the 6th century. In the 9th century the Scots became the leading power in the country, and the government was in the hands of Prince Kenneth Macalpin. The first great battle of Scottish princes on English soil was fought in 937 between Constantine their king, aided by the Danes, and Saxon King Athelstan. During the reign of Malcolm, the son of Constantine, Edmund, king of England, restored to that prince a part of the Cambrian kingdom, which Edmund had wrested from the Britons, and this grant was the pretext for the claim of homage from the Scottish rulers, made by the English kings for so many years. Malcolm II, Duncan and Macbeth, a usurper, the next three kings of Scotland, are well-known through Shakespeare's tragedy. Malcolm III defeated Macbeth in 1057. His wife was Margaret, the sister of Edgar, the Atheling of England, and her influence and that of his own life in England led to the introduction of English customs; while the tyranny of William the Conqueror drove large numbers of the Saxons into Scotland. The three sons of Malcolm who succeeded him, Edgar, Alexander and David, continued their father's policy; David was to Scotland what Arthur was to Britain. He established Norman, English and French colonies, introduced a system of written law, and placed the religion of the country on a new basis, providing for the support of the clergy and the building of churches. His grandsons, Malcolm IV and William the Lion, and Alexander II, the son of William, bring the list of Scottish kings to Alexander III, one of the ablest and best of their rulers. His sudden death in 1286 ended the period of Scotland's prosperity that had lasted for 400 years. The struggle for the succession between Balliol and Bruce and the ambition of Edward I of England, who had conquered Wales, to add Scotland to his kingdom, brought in the series of conflicts under Wallace and Bruce, ending in the battle of Bannockburn.

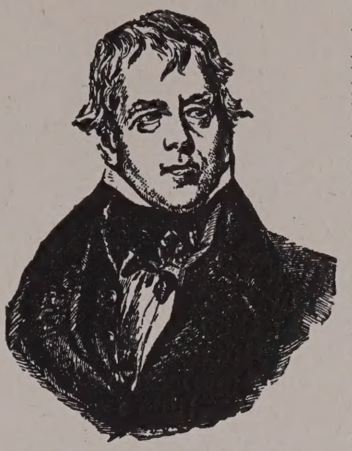
Robert I (Robert Bruce) was succeeded by David, his infant son, and his grandson Robert, who, as Robert II, heads the list of the Stuart sovereigns of Scotland, which numbers fourteen; an unfortunate race, including Robert II; Robert III, who died of grief, with his older son murdered and his younger son an English captive; James I, for eighteen years a prisoner in England and finally murdered; James II, killed in battle; James III, murdered with his son in rebellion against him; James IV, killed at Flodden; James V, who died broken-hearted at the rout of Solway Moss; Mary, twice a widow and twenty years a captive, beheaded at Fotheringay Castle; and James VI of Scotland and I of England. The feuds of the powerful nobles of Scotland and the struggles with England kept the country in a state of turmoil. In 1503 James IV married Margaret of England which finally resulted in the Union of the two kingdoms. Under James V religious struggles added to the troubles of the country, and James VI became king of England on the death of Elizabeth in 1603.

The Scotch parliament met for the last time in 1706. The leading statesmen of both Scotland and England felt that nothing but a complete union of the two countries would bring about permanent peace, and, though opposed by a majority of the people, the Scottish parliament passed the Act of Union on Jan. 16, 1707. The union was unpopular in Scotland for many years, but with the evident prosperity of the country under the new arrangement discontent gradually disappeared; though Scotland and England are still two countries, and a Scot abroad, if asked if he is an Englishman, will seldom answer "yes." The Gaelic language used in the west and north of Scotland is a Celtic dialect, while the Lowland Scotch is a form of the Saxon, being the same as the northern English of Northumbria. The dialects are many, classed as Border Scotch, Central Scotch and Northeastern Scotch. The chief cities of Scotland are Edinburgh the capital (population 355,300), Glasgow (872,021), Dundee, Aberdeen, Leith, Paisley and Greenock. Population 4,759,445. See BRUCE, ENGLAND, GREAT BRITAIN and MARY STUART. See *Scotland under Early Kings*, by Robertson; *Scotland as It Was and as It Is*, by Argyll; *Scotland from the Earliest Century to the Present Time*, by Mackintosh.

Scot'tish Literature. See LITERATURE, ENGLISH.

Scott, Captain Robert F., of the British navy, commanded two expeditions to the South Pole. He successfully reached the Pole with four companions January 18, 1912, and there found Amundsen's tent and records (See POLAR EXPLORATION). On the return journey with his three surviving companions, he perished in a blizzard. With his body was found his diary in which he recorded their misfortunes, and asked his countrymen to provide for their dependents. All were pensioned by parliament, and Captain Scott's wife given the title of "Lady Scott."

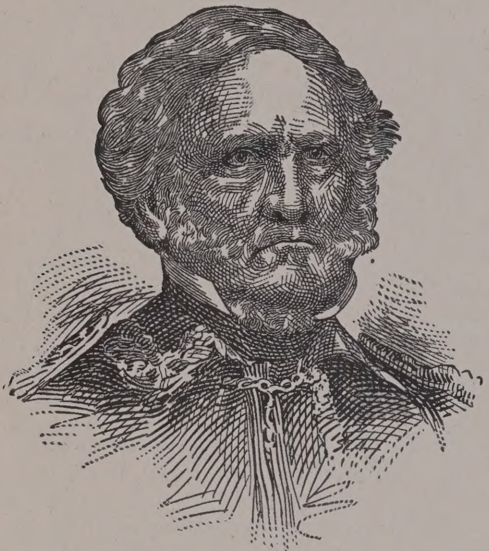
Scott, Duncan Campbell, was born in 1862, educated at Stanstead College (Quebec), and joined the Canadian Civil Service at Ottawa in 1879 and quickly received promotion. His short stories and poems have appeared in the best magazines. He is an editor of historical biographies now being published.



SIR WALTER SCOTT

Scott, Sir Walter, the Scottish novelist, was born at Edinburgh, Aug. 15, 1771. He became lame as the result of a fever when an infant. At Edinburgh University, where he studied, he declined to learn Greek, which he regretted in his later years. He studied law, and as a lawyer's clerk superintending the removal of a family who had not paid their rent he first entered the Highlands. His first publication was rhymed versions of ballads by Bürger (1796). The first two volumes of *The Border Minstrelsy*, for which he had been preparing himself by gathering legends and hunting up old ballads for nearly ten years, appeared in 1802. *The Lay of the Last Minstrel*, begun as a ballad, published in 1805, made him very popular; *Marmion* followed in 1808; and in 1810 came *The Lady of the Lake*. He was now offered the place of poet-laureate, but declined in favor of Southey. His first novel, *Waverley*, was begun in 1805, but laid aside until 1814, when he wrote the last two volumes in three weeks. *Guy Mannering*, "the work of six weeks," and *The Antiquary* followed, all "by the Author of *Waverley*," as Scott's authorship was not known. They were very popular, and in wonderfully quick succession followed *Rob Roy*, *Old Mortality*, *The Heart of Midlothian*, *Ivanhoe* and the rest of the world-famous stories. His purchase of Abbotsford, the sums spent on its improvement and his generous hospitality and liberality, especially to poor writers, had used up his large receipts from his writings. The failure of both the firms that published his works, in one of which he had been a secret partner, placed Scott heavily in debt. His friends offered help and his creditors a compromise, but he declined both, and at 55 bravely undertook to pay off a debt of $700,000 by his pen. He wrote 14 hours a day, producing his *Life of Bonaparte*, several series of *Tales of a Grandfather* from Scottish history and *Woodstock*. At a public dinner in Edinburgh in 1826 he made himself known as the author of the *Waverley Novels*; which the public had already discovered, and he afterwards furnished notes and prefaces for a new edition. But his excessive labors brought on symptoms of paralysis, and he sailed to Italy for rest, everywhere receiving the honors due to his literary fame. His failing strength warned him of the end, and he begged to be taken back to his beloved Tweed. He reached Abbotsford, where he died on Sept. 21, 1832. In the last moments of consciousness he turned to the window for a last look at the Tweed, and then said: "To-night I shall know all." At his death over $500,000 of his debts had been paid, and, soon after, the copyrights of his novels brought in sufficient to pay the last dollar. His novels have been translated into almost every civilized language. He was buried at Dryburgh Abbey, and a Gothic temple was built to his memory at Edinburgh. See *Life* by Lockhart; *Journal* by himself; and *Scott*, in the English Men of Letters Series, by R. H. Hutton.

Scott, Winfield, an American general, was born at Petersburg, Va., June 13, 1786. He studied at William and Mary College, and first became a lawyer, but in 1808 entered the army as captain. In the War of 1812 he was sent to the Canadian border, where he fought at Queenston and at Lundy's Lane, being taken prisoner at Queenston, but was soon exchanged and was wounded in both the battles, having two horses shot under him at Lundy's Lane. He was made a major-general for his services, receiving also the thanks of Congress. His services were helpful in preserving peace during the nullification troubles in South Carolina, where he commanded the Federal forces at Charleston Harbor, and also in the disputes about the border of Maine in 1839. As commander-in-chief of the United States army, which office he held from 1841, he took command of the invasion of Mexico in 1847. He captured Vera Cruz, and defeated Santa Anna at Cerro Gordo, taking Jalapa and Puebla. The battles of Contreras and Churubusco might have been followed by the taking of the capital, but an effort was made to negotiate a treaty. The castle of Chapultepec was taken by storm, and on Sept. 14, 1847, Scott's army marched into the City of Mexico, where he commanded until the treaty of peace was signed in February, 1848. He was a candidate for the presidency in 1852, but failed of election. At the beginning of the Civil War he was in charge of the army, but soon yielded his position to younger and stronger men. He died at West Point, May 29, 1866. Exceptionally competent military men rank him highly as a general. See *Life* by Mansfield and *Memoirs* by himself.



WINFIELD SCOTT

Scran'ton, Pa., a city on Lackawanna River, is 144 miles northwest of New York. It is a substantially built city and the third in size in the state. Its prosperity is largely due to its situation in the anthracite region, which gives it an immense coal-trade and a large business in mining-supplies. It has many and various industries which furnish employment for 30,000 people. There are great iron and steel factories, which produce locomotives, boilers, machinery and tools, besides many silk-mills, which give Scranton second place in the United States in this line. The large foreign population is principally engaged in mining. Much attention is given to school-work, and for this purpose there is an annual expenditure of half a million dollars. There are more than 40 public-school buildings, two high schools and one manual-training school. Scranton has ten colleges and academies, five public libraries and many beautiful churches. It has three electric lines and excellent railroad facilities, having the services of five railroads. Population 150,000.

Scream'er, a class of South American birds most nearly resembling ducks and geese. The horned screamer, found in Brazil and Guiana, is about as large as a turkey and blackish brown in color, with a long, slender horn on the head. It lives in swamps, eating the leaves and seeds of water-plants. The crested screamer has no horn, but, instead, a bunch of tall feathers. The name is given beause of its loud, harsh cry.

Screw, a simple mechanical device for transforming a motion of rotation into one of translation. An external or ordinary screw is made by cutting a spiral groove on the surface of a cylinder; an internal screw, generally called a nut, is made by cutting a similar groove on the inside surface of a cylinder. The elevation of metal adjoining this groove is called the thread of the screw. When the nut is slipped over the screw and held so that it cannot rotate, and the screw is placed in bearings so that it cannot be translated, it is evident that for every turn of the screw the nut must advance along the axis of the screw by a definite amount. The amount of this advance is called the pitch of the screw. The arrangement just mentioned forms the most accurate mechanical method for measuring small distances and for producing small displacements.

Ordinary screws are generally made by forcing a steel nut, called a die, over a cylinder of metal. In like manner, nuts are made by forcing a conical screw, provided with sharp cutting-edges, through a hollow cylinder of metal. This conical screw is called a tap. Higher grades of screws are made by placing a cylinder between the centers of a lathe and then moving the cutting tool along the lathe-bed on a carriage which is itself operated by another screw.

With elaborate precautions, Professor Rowland (*q. v.*) succeeded in this way in making a more perfect screw than had ever been made before, on which, when finally corrected, moved the ruling-point of a dividing-engine with such accuracy that no single ruling was in error by as much as 1-100,000 of an inch. Woodscrews, so-called, are metal cones, upon which a thread has been cut and a slotted head made. They have pointed ends for starting into wood, where they cut their own nuts and act rather as *clamps* than *screws*. Consult SCREW, in *Encyclopædia Britannica*, by Rowland and Rankine's *Machinery and Millwork*.

Screw-Propel'ler, a wheel with two or more radial blades in the form of a helix or spiral, used to propel a vessel. In modern ocean-steamers, there generally are two propellers, one on each side of the keel. The action of the propeller is similar to that of a screw revolving in a fixed nut, the water being more or less fixed as regards the revolving propeller. The screw-propeller was suggested by Bernouille of France in 1752, and in 1801 John Stevens of Hoboken, N. J., made a successful experimental boat with a screw-propeller. But it was not until between 1835 and 1840 that it began to come into general use. Its practical use was then demonstrated by F. P. Smith in England and by Capt. John Ericsson, first in England and later in the United States. Ericsson is generally given the credit of having made the first successful application of the screw-propeller to steam-navigation. At present it is the only method of propulsion used on large steam-vessels. The design of the shape and size of the propeller depends on conditions more or less peculiar to each vessel, and requires not only calculations but often experiments before the best shape is found for a given boat. Propellers are generally made of gun-metal. The dimensions of the propellers and shafts on the transatlantic steamers are very large. For the *Celtic*, a White Star steamer of 14,259 tons displacement, the two propellers each have a diameter of 20 feet and are carried on steel shafts of 19½ inches diameter. Consult the U. S. Navy Dept.'s professional papers.

Scribe, a name used among the Jews originally to indicate a military officer, whose business was recruiting soldiers and levying taxes. Later the name was given to those who copied the books of the law, and, as those who copied the law became its best expounders, the word had in the time of Christ come to mean an expounder of the law or a learned man. Scribes were found all over Palestine, and were reverenced by the people as public teachers and lawyers. Some were members of the Sanhedrin or court, and some had public class-rooms, where their disciples sat at their feet. Those who did not fill these higher places were engaged in copying the books of the law and of the prophets and in writing contracts, letters of divorce etc. See Schürer's *History of the Jewish People in the Time of Christ*.

Scud'der, Horace Elisha, American man-of-letters, was born at Boston, Mass., Oct. 16, 1838, and graduated at Williams College. After teaching for three years in New York City, he took to writing stories for youth and edited a magazine in their interest. From 1890 to 1898 he edited *The Atlantic Monthly*, and became a resident of Cambridge, Mass. Here he assiduously pursued a literary life, writing, besides his successful series of *The Bodley Books* and a brief *History of the United States*, a monograph on *Noah Webster*, an historical biography of *Washington* and a collection of essays and criticisms entitled *Men and Letters*. He was the editor, also, of the series of volumes of the *American Commonwealths* and author, jointly with Mrs. Taylor, of the *Life of Bayard Taylor*. He was one of the writers, moreover, of Bryant and Gay's *History of the United States* and of Justin Winsor's *Memorial History of Boston*. Above all, he wrote the classic biography of James Russell Lowell. He died on Jan. 11, 1902.

Sculpture (*skŭlp'tûr*), from a Latin word meaning to cut out or carve, is the art of representing the form of an object in a solid substance. When a figure is only partly raised from a background, it is called relief and has different names according to the degree in which it is raised, as bas-relief, meaning low relief. Wood, marble, granite, bronze, gold and ivory are some of the materials used in sculpture, anything that can be cut or molded into shape being used. The Greeks and Romans worked largely in marble, especially the pure, white marble brought from Paros (*q. v.*) called Parian marble. The art is an ancient one, beginning with the use of memorial stones and the making of images of the gods. The Egyptians are among the earliest nations to use sculpture in their religion, their temples being covered with reliefs, while innumerable statues of gods stood upon their plains. The Sphinx was probably sculptured about 4,000 B. C. The specimens of Assyrian sculpture found belong to the 9th and 8th centuries B. C. and are largely bas-reliefs, made on a large scale and of curious forms, as the colossal winged bulls, with human heads, that guarded their palaces. The first monument of classic Greek art which has come down to the present time is the marble statues on the temple of Athena at Ægina by an unknown author. They now are at Munich. Pheidias, the greatest of Greek sculptors and of the world, known by his great work, the Parthenon was followed by Praxiteles, Scopas and Lysippus, with such works as the *Venus of Milo*, *Apollo Belvedere* and *Laocoön*. The best artists of Rome were Greeks, and her treasures of art were largely brought from the plundered cities of Greece. For centuries the art of sculpture was almost lost until the 14th and 15th centuries, when Ghiberti made his wonderful gates at Florence and Donatello his statues of St. Mark and St. George, and Michael Angelo towered above all others. The 17th century witnessed only a falling back in the art of sculpture, with no immortal names among the artists; but the names of Houdon, Canova, Chantrey, Gibson, Thorwaldsen and Rude, among others, adorn the 18th century. The art had many followers in the 19th century, as Alfred Stevens of England, with his magnificent monument to the Duke of Wellington, and Barye, Rodin and many others in France, and Powers, Crawford, Greenough, Rogers, MacMonnies and St. Gaudens in the United States. See *History of Sculpture* by Lübke and *History of Greek Sculpture* by Murray.

Scutari (*skōō'tä-rē*), a town in Turkey, on the eastern shore of the Bosporus, opposite Constantinople, of which it is a suburb. It is built on the slopes of a hill, and has handsome mosques, bazars, a *dervish* college and factories of cotton, silk and leather goods. It is famed for its large cemeteries adorned with great cypress-trees, where many of the Turks from the city are buried, because it is the sacred soil of Asia. During the Crimean War the barracks and hospital of the English troops were at Scutari, and formed the scene of Florence Nightingale's labors. A marble obelisk marks the site of the English burial place. Population from 30,000 to 40,000. Scutari also is a government in Albania; area 4,170 square miles; population 294,100.

Scylla and Charybdis (*sĭl'lȧ and kȧ-rĭb'dĭs*), in Greek legend, were two sea-monsters who dwelt on opposite sides of a narrow strait. Scylla had 12 feet, six necks and six mouths, with three rows of teeth in each, and barked like a dog. Charybdis lived on a cliff under a large fig-tree, and three times a day she sucked up the waters of the sea, and three times threw them back. Ulysses passed safely between the monsters, but Scylla snatched away six of his sailors. The names are now applied to a whirlpool in the Straits of Messina near Italy. From the difficulty of passing between them without falling into one or the other rises the proverb, To shun Charybdis and fall into Scylla.

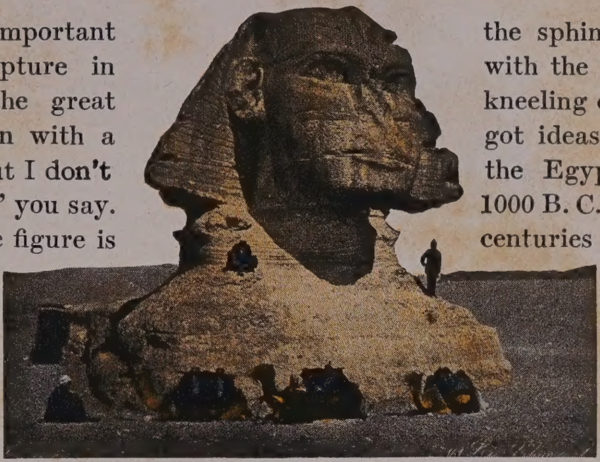
Scythians (*sĭth'ĭ-ans*), an ancient race of Asia. The name is given either to the Scythians proper, the Scolots, or to all the wandering tribes who lived on the steppes from Hungary to Turkestan. The Scythians proper were a wandering people, living in the treeless plains between the Danube and the Volga. They lived in tent-covered wagons, kept herds of horses, cattle and sheep, fought with bows and arrows on horseback, made drinking-cups of the skulls of their enemies, and worshiped (without images) gods like those of the Aryan Greeks. They seem to have learned some of the arts of civilized life from the Greek colonies, and a Scythian king went to Athens to study under Solon. In the 7th century they invaded Media occupying it ten years, until Cyaxares made all their chiefs drunk at a banquet and slew them. The Scythians of Europe were nearly exterminated by the Sarmatians (*q.v.*) in the 4th century. The Scythians of Asia overran Parthia (northeastern Persia) about 128 B. C., and founded a kingdom in the eastern part of the empire, so that that part of Asia was called Indo-Scythia. In the century before and the century after Christ they invaded northern India, where they held possession for four or five centuries. Consult Mahaffy's *The Greek World under Roman Sway*.

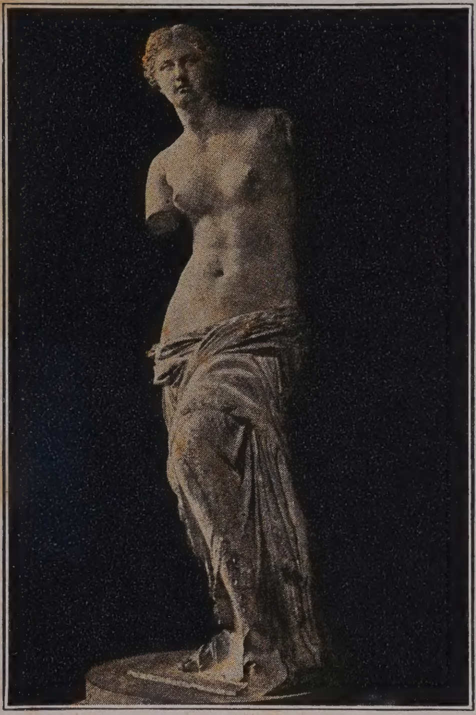
Sea. The waters of the sea cover about 143,259,300 square miles or about five sevenths of the earth's surface. The ocean-basins are filled with sea-water to within about 2,250 feet of the general level of the continents, the average depth of the water in these basins being 12,480 feet. Were the solid crust of the earth to be reduced to a level, the surface of the earth would then be covered by a universal ocean with a depth of about two miles. The greatest depth recorded is 4,655 fathoms in the North Pacific, east of Japan. The bulk of water in the whole ocean is stated to be 323,800,000 cubic miles. The temperature of the surface waters varies from 28° F. in the polar regions to 85° or 86° F. in equatorial regions. The bottom waters vary from 32.7° F. to 36.8° F. At a depth of a little over half a mile the water of the tropics generally has a temperature below 40° F. The circulation of oceanic waters is kept up by the action of the prevailing winds on the surface layers. In the southern hemisphere the warm water of the tropics is driven to the south along the eastern coasts of South America, Africa and Australia, till, between 50° and 55° latitude, it sinks on being cooled, and spreads slowly over the ocean floor to the

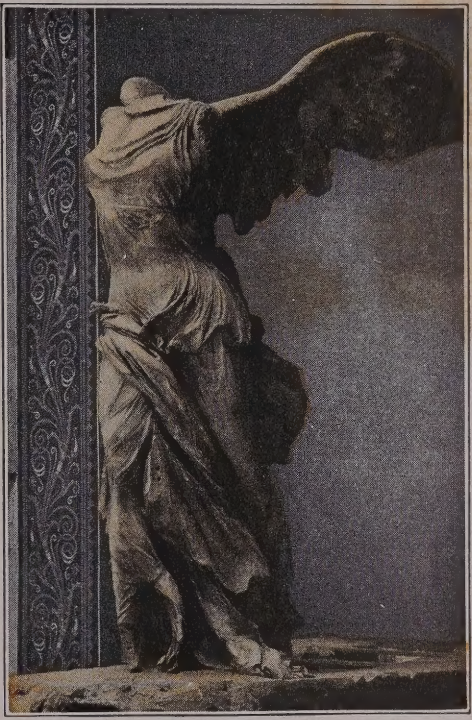
Poems in Stone

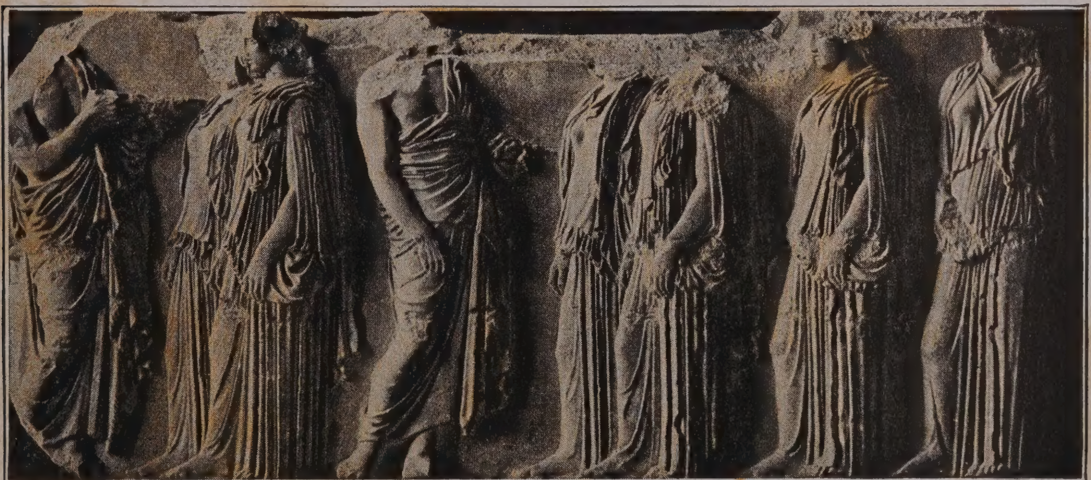
Great Works of the Ancients

THE oldest important piece of sculpture in existence is the great Sphinx, a huge lion with a human head. "But I don't see any lion's body," you say. That is because the figure is half-buried in the desert sand. Compare the height of the man standing under the chin, with the face of the sphinx, and its breadth with the length of the three kneeling camels. The Greeks got ideas of sculpture from the Egyptians as early as 1000 B. C. It took them many centuries to bring sculpture to the perfection of the Venus, the Winged Victory and the noble figures of the Parthenon.


The Sphinx


Original in the Louvre, Paris
Venus de Milo

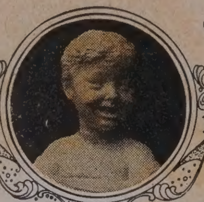

Louvre
The Winged Victory


From the Frieze of the Parthenon
The Panathenaic Procession

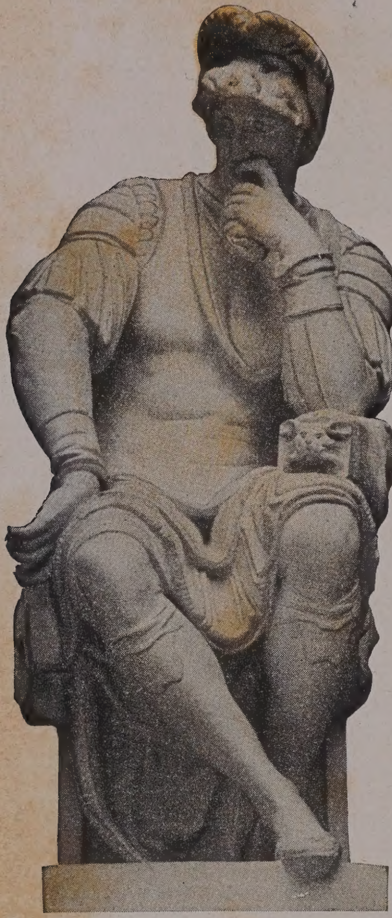
Poems in Stone

The Works of Modern Masters

ON this page we pass to modern sculpture. What an inspiring note we have in this beautiful "Laughing Boy" by Donatello—a perfect type of the happy childhood at which modern education, among other things, aims. The original is in Florence.

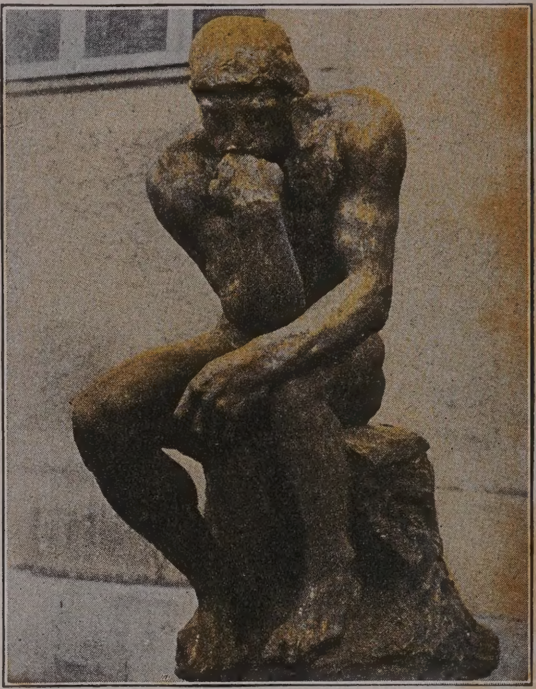


The Lorenzo de Medici is also called "The Thinker." Compare this cultivated, aristocratic nobleman with Rodin's "The Thinker"—primitive man gazing at his descendants in Dante's "Inferno." How far man has progressed *materially* since his time; how slow man's progress in *moral* civilization!



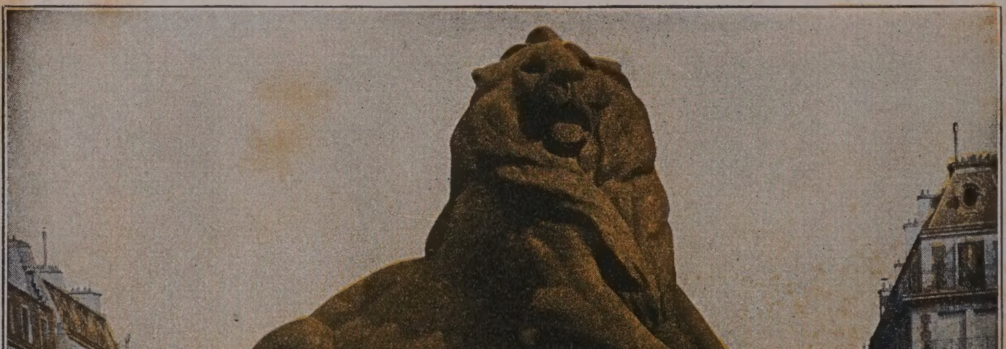
Thistle Print, Detroit Publishing Co.

Lorenzo de Medici, by Michelangelo
(Italian b. 1475)



Rodin Museum, Paris

The Thinker, by Auguste Rodin
(French b. 1840)



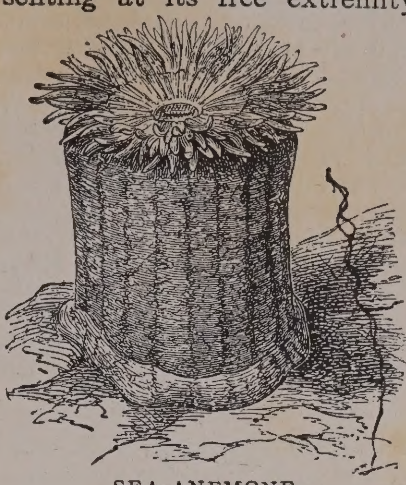
The Lion of Belfort, Belfort, France, by F. A. Bartholdi (French b. 1834)

Commemorates gallant and successful defense of the town in Franco-German War.

north and south. A similar circulation takes place in the north; the cold water which occupies the deeper parts of the Arctic basin is largely made up of the dense Gulf-Stream water which sinks to the bottom on being cooled in the Norwegian sea. The water evaporated from the sea is borne to the land, and condensed on the mountain slopes. Over 6,500 cubic miles of this water are yearly sent back to the sea by rivers, carrying with it salts and earthy matters; in this way the ocean has in all probability become salt in the course of ages. The saltest waters are found where evaporation is the greatest, for example in the Red Sea, the Mediterranean and the trade-wind regions of the ocean-basins. Owing to the constant circulation in the ocean, oxygen and other gases of the air are carried down to the greatest depths; thus animals and plants may flourish throughout the whole extent of the ocean. Water is but slightly compressible, and almost any substance which will fall to the bottom of a tumbler of water will in time fall to the bottom of the ocean. Still, the pressure amounts to four or five tons per square inch; hence in an ocean with a depth of five miles, were the action of gravity suddenly to stop, the ocean-waters would rise 500 feet above their present level by expansion.

Pure sea-water is a light shade of blue; but it sometimes is a shade of green or brown, owing to foreign matter or plants and animals floating in it. Some form of life is scattered throughout the whole ocean. A trawl at a depth of over two miles brought up 200 specimens of living animals; a trawl in about three miles' depth yielded 50 specimens; and fishes and animals have been found at over four miles' depth. The term *benthos* is now used for all animals and plants which live attached to, or creep over the bottom of the ocean, *plankton* being the term for all plants and animals which live in and are carried along by the currents of the ocean. Life is most abundant in the surface waters down to about 100 fathoms, is less abundant in the intermediate regions, and becomes more plentiful within a few hundred fathoms of the bottom. The shells and skeletons of animals and fishes fall to the bottom after death and make a large part of the sea-deposits in many regions, especially in the deeper parts of the ocean. Besides these pelagic deposits, there are others, mainly made up of the débris from the solid land of the globe, laid down in greater or lesser nearness to the shores of continents and islands, which are called terriginous.

Sea-Anem'one. A kind of polyp which does not secrete a coral-stock. They resemble flowers in shape and coloration, and are among the most interesting organisms to be met with on the sea-beach. They prove a great attraction in aquaria. Their essential structure is that of a fleshy cylinder attached by its base to a rock and presenting at its free extremity the mouth surrounded by a fringe of tentacles, sometimes as many as 200, by which the little animal seizes its food,—small crustaceæ and mollusks. They are practically stationary, but can move very slowly over the surface to which they attach themselves. They grow to three inches in diameter. They multiply by budding and by eggs. They are very long-lived. One taken by Sir John Dalyell in 1828 lived until 1887. They are used as food in Italy, Greece, Provence and various other coasts.


SEA-ANEMONE

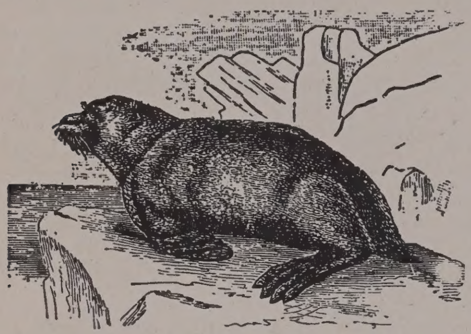
Sea-Cu'cumber is a name applied colloquially to the holothurian, which is a soft and worm-like sea polyp. All these species have a very simple bodily structure, with great power of reproducing parts that are injured or lost. They possess sensitive tentacles at the mouth. The large sea-cucumbers or sea-slugs, known as *beche-de-mer* or *trepang*, are highly prized by the Chinese for food. *Trepang* properly is the dried body of this sea-cucumber. It is gelatinous, and used in soup. Sea-cucumbers are most numerous in the warmer reigons of the Pacific.

Sea-Hare. A small mollusk, slug-like in appearance, deriving its popular name from the prominent character of its front pair of tentacles, which somewhat resemble the ears of a hare. They are widely distributed and generally inhabit muddy or sandy tracts. They feed on sea-weeds and small crustaceans. Sea-hares were notorious among the ancients for their supposed venomous properties, and were used as ingredients of poisonous potions. A chief proof of the magic-practice of Apuleius was the fact that he obtained sea-hares from fishermen. They are harmless, but some species exude an acrid liquid irritating to the human skin. They also emit a rich, purple fluid which, like the ink of the cuttlefishes, has the property of diffusing itself quickly throughout the surrounding water.

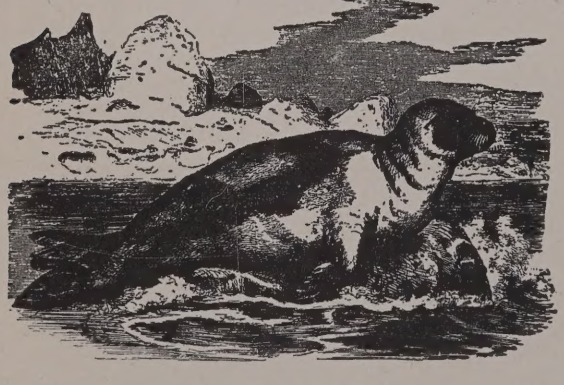
Sea-Lion. See SEAL.

Sea-Ur'chin, a very common sea-animal grouped with the *Echinoderms*. The common sea-urchin has a globular shell or *test* composed of carbonate of lime, and made of six-sided plates nicely fitted together. The shell is covered with spines, which vary in length and size according to the variety of the animal. Five rows of the plates composing the shell are perforated by openings for the tube-feet, and five rows are without such openings. The animals move mainly by tube-feet, but the spines also are movable and aid in locomotion. The mouth, with a complicated masticating apparatus, is on the under side. They feed on seaweeds and organic matter found in the mud. Some forms are flattened and called sand-cakes. For illustration see ECHINODERMATA. See, also, SAND-DOLLAR.

Seal, a carnivorous animal fitted for a life in the water. The animal famous for yielding the valuable fur, called seal-skin, is not a true seal, but a kind of sea-lion with ears and more flexible limbs. The true seals have no external ears and their hind limbs are closely united together, being useless on land but very effective in water. The hind limbs of the sea-lions are separated, and are used by the animal when on land. All kinds of seals come on the land or on ice in great numbers during the breeding-season. The true seals vary from four to eight feet in length. Their fur is stiff, and they lack the woolly under fur of the fur-seals. They occur on both sides of the Atlantic. The common harbor-seal is found on British coasts and on those of Europe and North America. It is four or five feet long, usually yellowish gray, with darker spots. The Greenland seals are larger; they congregate on shore in immense numbers for breeding. All true seals are awkward on land, and move by means of the muscles of the trunk, assisted a little by the fore limbs. The hind limbs are entirely passive. A large number (390,174 in 1892) are killed annually for their hides and oil. Seals feed mainly on fish but also eat crustacea and mollusks. The harbor-seals are sometimes destructive to salmon. The eared-seals, sea-lions, or sea-bears vary greatly in size. The larger ones reach a length of about ten feet. Their hind limbs are flexible and they make considerable journeys inland, but return to the water for food. To this group belong the fur-seals of the northern Pacific. They are of moderate size, a full-grown male being about six feet and a female about four feet in length. These animals breed on the Pribilov, Commander and Robben Islands of the North Pacific and of Bering Sea. Since 1835 they have in a measure been protected by law. The males three years old — at which age their fur is finest — are taken for their skins, with unusually large ones two years old and small ones four years old. From 1871 to 1889, inclusive, about 100,000 animals were taken annually, but they began to show a decline in 1885, and in 1890 only 21,000 skins were secured. In 1895 and 1896 the number was reduced to 16,000 and 15,000 respectively. Controversies in reference to these seal-fisheries arose between the United States, England and Russia. The questions were referred to arbitrators who met in Paris in 1893. In 1896 the United States and Great Britain each appointed a commission to study the life of the seals and the causes for their decline in numbers. The members of the American commission reached the conclusion that the decline in the herds is due to killing females in the open sea, where the sex cannot be readily distinguished. This form of capture should be abandoned, and the hunt for skins should be confined to killing on the land and restricted to three-year-old males. See Allen's *Fur-Seal and Other Fisheries of Alaska* (Washington, 1889), and Jordan's *Report of the Fur Seal Investigations* (Washington, 1898).



FUR-SEAL



GREENLAND SEAL

Seal'ed Orders are orders which are delivered to the commanding officer of a ship or squadron, sealed and only to be opened when at sea. The commanding officer of a ship or squadron is sent to sea under sealed orders when sailing on any secret service, to prevent the destination and object of the expedition from becoming known. The commander, equally with all under him, is ignorant of where he is to sail or what he is to do until the seal is broken

Seal'ing-Wax. Before ordinary sealing-wax was known in Europe, colored beeswax was used for sealing letters and documents. Sealing-wax was probably first made in India or China. The best red sealing-wax is made of shellac, Venetian turpentine and vermilion to which is often added magnesia, chalk or gypsum. In parcel-wax the main ingredient is common resin.

Seasons (*sē'z'nz*). The motions of the earth on which the seasons depend are explained in EARTH. The chief cause of the greater heat of summer and the greater cold of winter is that the sun's rays fall more obliquely on the earth's surface in the latter season than in the former. Another cause is the greater length of the day in summer and of the night in winter. In the tropics the sun's rays always are so nearly direct that no one part of the year is sensibly colder than another. But the zone of calms, in which the rainfall is almost continuous, moves northward with the sun in the northern summer and southward in the southern summer. As the wet zone follows the sun, the regions it crosses have wet and dry seasons. In the arctic and antarctic regions spring and autumn are very short, the year dividing itself simply into a long winter and a short summer. In temperate regions the year is naturally divided into spring, summer, autumn and winter. The almanacs assume that spring begins at the vernal equinox, March 20; summer at the summer solstice, June 21; autumn at the autumnal equinox, Sept. 21; and winter at the winter solstice, Dec. 21. However, the greatest heat is reached sometime after the summer solstice, the time when the sun's rays are most nearly vertical and the day is longest. In like manner the greatest cold of winter comes after the winter solstice the time when the day is shortest and the sun's rays most oblique. The reason in the former case is that, as summer comes on, the earth itself becomes more heated; in the latter, that it keeps a part of the heat which it had got in summer, just as the warmest part of the day is a little after midday and the coldest part of the night is toward morning.

Seath, John, was born in Fifeshire, Scotland, in 1844. He obtained his degree in arts at Queens College, Belfast, winning prizes and a medal. He moved to Canada in 1861, and in 1862 was appointed head-master of Brampton High School (Ontario). For ten years (1874–84) he was head-master of the Collegiate Institute at St Catherines, and in 1884 he was appointed inspector of high schools. He is the author of a grammar for senior scholars and of a school-edition of Milton, and is senator of the University of Toronto. Mr. Seath's services to the cause of education in Ontario can scarcely be adequately valued. Especially in the cause of secondary education has he been privileged to do lasting good. He now holds the position of superintendent of education for the province.

Seat'tle, Wash., a port of entry and largest city of the state, is the county-seat of King County. Rising from the shores of Elliott Bay on the west, the city covers numerous hills, embraces Lake Union and Green Lake within its borders, and reaches on the east to Lake Washington, a beautiful body of fresh water 22 miles long and from one to three wide. The business district is substantially built in the manner of a progressive, modern city; the hills are covered with handsome homes and attractive cottages; the parks and boulevards are being made into a system of rare beauty and extent; and the scenery afforded by the combination of lakes, sound and mountains is striking and beautiful. Public buildings, prominent among which are the library and the new Federal building; schools and educational institutions, as the high schools and the University of Washington; houses of worship, with the Roman Catholic cathedral and the new First Presbyterian church as conspicuous edifices; and good hotels, theaters and club-houses are numerous. The school-system is excellent, the buildings fine, and textbooks are furnished free. Higher educational institutions consist of the University of Washington; the College of the Immaculate Conception (R. C.); Holy Name Academy (R. C.); and Seattle Seminary (M. E.) Transportation facilities, position as a distributing point both for domestic and for foreign markets, supply of fuel and cheap power and raw material for various lines of industry are causing Seattle rapidly to become a manufacturing center. Among the chief industries are ship-yards, flour and rolling mills, shingle and lumber mills, foundries, iron-works, fishcanning and woodworking.

Piers for handling ocean and land traffic line the front of Elliott Bay. The commerce of the port has advanced with astonishing rapidity, and it has grown still faster since the connection of Lakes Washington and Union with Puget Sound by means of a canal capable of floating the largest ships was completed. King County raised money for the building of this important aid to its commerce by levying a tax on a specially created assessment district, authorized by the Legislature. The canal, which gives to Seattle a fresh-water harbor unexcelled, was built in accordance with plans made by the national government. The bulk of the Alaskan trade passes through Seattle.. Several lines of steamships, including the largest freight-carrier in the world, ply regularly between Seattle and the Orient and other parts of the world, particularly to the countries bordering on the Pacific. The Northern Pacific and Great Northern railways have vast terminal facilities, while the Union Pacific and Chicago. Milwaukee and Puget Sound, have acquired holdings almost equally large. The Burlington and the Canadian Pacific reach the city by traffic arrangements with existing transcontinental systems.

The water-plant is owned by the city, and water is supplied by Cedar River and Cedar Lake. From the fall of Cedar River power is obtained to operate the lighting-plant, which is also owned by the municipality. Seattle has a fine street-car system and all modern improvements. Excellent interurban lines radiate into surrounding territory and connect the city with Tacoma and Everett. Seattle was settled in 1852, laid out in 1853, and named in honor of a noted Indian chief. It incorporated in 1865 and re-incorporated in 1869. In 1880 it had a population of 3,533; in 1910 this had become 237,194. It is now 330,884.

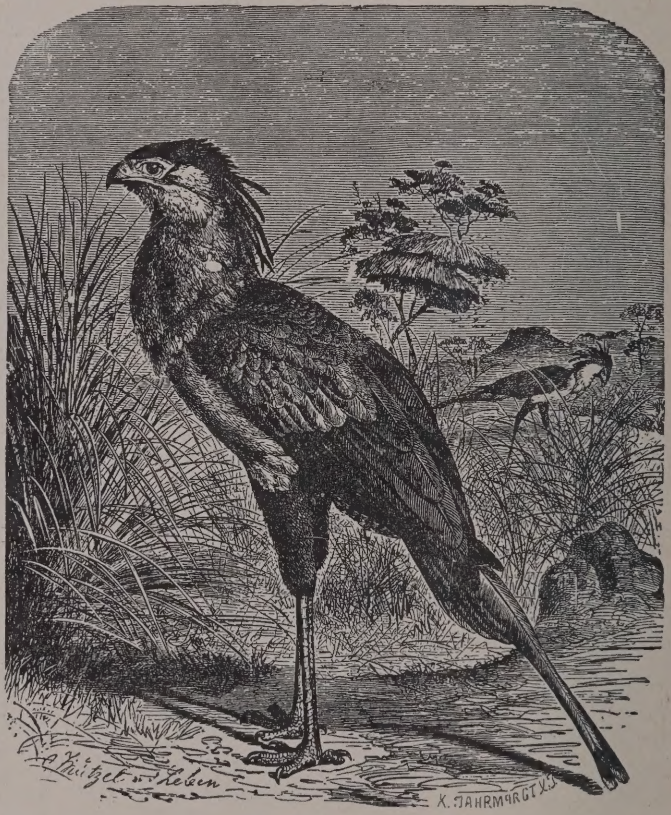
Sea′weeds. See ALGÆ.

Sebastian (*sē-băs′chan*), **St.,** a martyr of the early church, was a native of Narbonne. Under Diocletian he became a captain of the prætorian guard and secretly a Christian. It came to the ears of Diocletian that Sebastian encouraged those who were being led out to death for being Christians; so the emperor had his captain tied to a stake and shot by archers. But they did not wholly kill him; a pious woman named Irene took him away and tended his wounds. As soon as he recovered, Sebastian boldly faced the tyrant and upbraided him for his cruelty. Diocletian then ordered him to be beaten to death with rods (about 288 A. D.). His first martyrdom — a young and handsome soldier bristling with arrows — was a favorite subject for the Italian religious painters, as Mantegna, Veronese and Domenichino.

Sebastopol (*sē-băs′tō-pōl′*), a Russian seaport and fortress, is near the southwestern end of the Crimea, on the southern side of one of the finest harbors in the world. The place is celebrated for its long siege by the French, Turks and English in the Crimean War of 1854-5. The town and harbor were defended by forts of immense strength, built of limestone faced with granite, on which artillery made little impression. On the land-side the earthworks and fortifications raised by General Todleben kept the armies of France and England at bay for 11 months. But the capture of the Malakoff and Redan works at length forced the Russians to evacuate the lines. The town was mined and the docks and forts blown up by the allies. The fortifications and docks have since been rebuilt. The imports are mainly cotton and coal; the exports, grain. The town was founded in 1783 under orders of Empress Catharine II. Population 53,595, including a garrison of 12,000. See Leo Tolstoi's *Sebastopol.*

Secord, Laura, a heroine of the war of 1812. On June 23, 1813, Col. Boerstler, U. S. A., with 550 men and two cannon, advanced upon the little outpost at Beaver Dam near old Fort George. News was borne to the garrison under Lieut. Fitzgibbons by Laura Secord, whose husband lay wounded in Queenston. She set out at dawn, driving a cow by way of pretext to pass the American sentry, ran and walked through the wildest of woods for 20 miles, and late in the day arrived with her intelligence. As a result 200 Indians succeeded in ambushing Boerstler's command, which surrendered, laying down their arms to a British lieutenant with 260 Indians, militiamen and regulars.

Sec′retary=Bird, a large bird of South Africa, receiving its name from the arrangement of a number of black and gray quills over the ear, in the position of a clerk's pen. It belongs with the birds of prey, but on account of its long legs, has been classed with the wading birds. From its eating snakes it has also received the name of the serpent-eater. The bird is about four feet long from bill to tip of tail, which is about two feet long. The legs and neck are both long, and the body makes up only a small part of the bird. The general color of the plumage is clear gray. They are shy in their native haunts, but have been domesticated by Cape Colony farmers. Their



SECRETARY BIRD

favorite food seems to be frogs and toads, but lizards and many snakes are devoured. The nest is built high up in a tree, and two or three, large, white eggs are deposited. On the ground the bird walks with a stiff military gait, but can run with great swiftness.

Secre'tion (in plants), in its broadest sense, the process by which substances are separated from the protoplasm; also the substances so separated. In this sense the cell-wall and starch-grains are secretions, since they are formed by the protoplasm and separated from it. The term is usually applied, however, to waste products (sometimes distinguished as excretions) or to products which have some special function, *e. g.*, enzymes (*q. v.*) and nectar. The number and variety of secretions are very great. Some are formed in a special cell or group of cells, constituting a gland, which may be on the surface (*e. g.*, in geranium leaves) or may adjoin an internal space into which the secretion is poured (*e. g.*, resin-glands of pines). In other cases the secretion accumulates in the gland-cells, which finally die, leaving a mass of the secretion occupying their room, *e. g.*, in orange-rind. The methods by which the secretion is put forth from a cell are not known.

Seda'lia, Mo., in the center of the state, is surrounded by a fertile, prosperous agricultural district. Its industries comprise two railway shops, a packing house, a foundry and implement factory, and manufactories of clothing, candy, carriages, wagons, cigars, beer, ice, carbonated drinks, butter, etc. Its transportation facilities consist of two trunk lines and three branch railroads. There are three colleges, a high school and 12 ward schools in Sedalia. Population, 25,000.

Sedan (*sē-dăn'*), a town and frontier fortress of France, stands on the Meuse 64 miles northeast of Rheims. The citadel surrendered to the Germans in 1815; but Sedan is chiefly noted for the surrender, Sept. 2, 1870, of Napoleon III and 86,000 men to the Germans in the Franco-Prussian War. The Germans, under the command of King William of Prussia, began the battle on September 1. By manœuvers and hard fighting the French under Marshal MacMahon were driven from all sides to the fortress, where, defeated, surrounded and without provisions, they were forced to surrender. The emperor was sent a prisoner to Wilhelmshöhe, and two days later Gambetta proclaimed the republic at Paris. Colbert founded at Sedan cloth-mills, which now employ 10,000 men. Sedan chairs were named from this town, where they are said to have been invented. Population 19,350.

Sed'don, Richard John, premier and treasurer of New Zealand and minister of labor defence, education and immigration was born at Eccleston, Lancashire, England, in 1845, and educated there. He went to New Zealand in 1867 A mechanical engineer by profession, he had an intimate acquaintance with workingmen and their needs, and was continuously in public service after entering its house of representatives in 1879. His death occurred on June 10, 1906.

Sedge, the name of a family of plants, one class of which contains over 200 kinds in North America. They are mostly found in swamps and other wet places, forming often thick tufts. The stems are solid and triangular. Sedges are most common in cold countries. They differ in some important respects from grasses, especially in being worthless as pasture or food plants

Sedg'wick, Catherine Maria, American novelist and writer, was born at Stockbridge, Mass., Dec. 28. 1789, and died near Roxbury, Mass, July 31. 1867 She was the daughter of Theodore Sedgwick (1747-1813), the Federalist politician and jurist. She herself is noted as one of the earliest of American women of letters, a contributor to the *Annuals* in vogue early in the literary history of the United States, and a voluminous and entertaining writer of moral tales and miscellanies. Her chief works embrace *A New England Tale; Redwood*, reprinted in England and appearing in three or four European translations; *Hope Leslie;* and *Linwoods.*

Sedgwick, John, was born at Cornwall, Conn., Sept. 13, 1813. A West Point graduate, he served in Florida as second-lieutenant when the Cherokees were removed He also served through the Mexican War, gaining promotion at Contreras, Churubusco and Chapultepec. His record in the Civil War was brilliant. By the spring of 1862 Sedgwick was in command of a division, and in July of that year was made major-general of volunteers. As commander of the 6th or Sedgwick's corps, as it was called, he made a forced march of 35 miles to Gettysburg, and there commanded the left wing in the battle. Three days after the battle of the Wilderness May 5 and 6, 1864, in which he had taken part, he was shot by a sharpshooter while ordering a battery to be brought into position See MacMahon's *Address on Major-General Sedgwick.*

Seebeck (*zā'bĕk*), **Thomas Johann,** a German physicist, born April 9, 1770, at Reval, died on Dec. 10, 1831, at Berlin. Seebeck will be remembered principally for his very important discovery of thermo-electric currents sometimes called the Seebeck effect This is the converse of the Peltier effect (See ELECTRICITY.) For an excellent account of these two "effects" see J. J. Thompson's *Elements of Electricity and Magnetism*, ch. 14

Seed-Disper'sal is the scattering of plant reproductive bodies, especially seeds and the seed-vessels (see FRUITS) containing them, by wind, water, animals and other agencies The benefit to the plant is in getting away from the parent plant and getting a foothold in soil not already exhausted of those elements needed by that particular species. These bodies may be carried by the wind by being light or by having sail-like or feathery appendages on the seed, as the milkweed and catalpa, or on the seed-vessel, as the maple and dandelion. Spines or hooks, usually a part of the seed-vessel, fasten to birds or other passing animals, as is done by the burdock and stick-tights. Indigestible seeds of edible fruits are carried by birds. Seeds are carried by mud clinging to the feet of water-birds. For other methods of spreading than by seeds, usually considered in this connection, see Propagation. Consult Beal's *Seed-Dispersal.*

Seed-Plants. The common name of Spermatophytes (*q. v.*).

Seeds. In general a seed is a transformed ovule, and an ovule is an megasporangium (*q. v.*). The transformation is connected with the process of fertilization. The most apparent effect is the development of the hard coat or *testa*, which has to do with the protection of the delicate structures within. This *testa* is usually formed in connection with the integument of the ovule. Within the seed-coat the essential thing is the embryo (*q. v.*). Around the embryo may be deposited more or less endosperm (*q. v.*), and outside of the endosperm, in some seeds, is the perisperm (*q.v.*). A seed is well-devised for carrying a plant through an unfavorable season of drought or cold. The length of time a seed may retain its vitality and be made to germinate is known only in the most general way. The old story of the germination of wheat derived from mummies in Egypt was contradicted almost as soon as it was started, but the contradiction has never yet overtaken the original statement. That seeds may endure for several, often for many, years and then be made to germinate is well-attested, but the data are very uncertain. Seeds must be carried out of reach of rivalry with the parent-plant and with each other. Various agencies have been used to effect this dispersal: (1) *Currents of air.* The wind transports numerous seeds, which have been prepared for this agency in a variety of ways. Some have tufts of hair, others plumes, others wings. Often it is the fruit rather than the seed which bears the tuft of hairs (as thistle) or the wings (as maple), but the result is the same. (2) *Currents of water.* Many seeds may be carried long distances by water and still be able to germinate. The banks and flood-plains of streams constantly receive seeds from the regions toward the headwaters, and the more extensive the area drained by a stream the more varied is the collection of seeds on its flood-plain. The oceanic currents probably carry seeds the greatest distances, transporting them from continents to islands, even from continent to continent. By experiment Darwin found that numerous seeds could be soaked in sea-water long enough to be carried over 1,000 miles by an oceanic current without losing the power of germination. (3) *Animals.* Many seeds and fruits develop grappling appendages of various kinds, by means of which they adhere to animals brushing past, as the tickseed, Spanish needle etc. Migrating birds, especially those which visit marshy shores, are great carriers of seeds which are imbedded in the mud adhering to their feet. Fruit-eating birds also transport seeds, which may pass through the alimentary tract without losing the power of germination. (4) *Explosive fruits.* In some cases fruits have the power of forcibly discharging their seeds, as the violet, witch-hazel, touch-me-not etc. This method is interesting, but not so effective as the others, since the distance traversed is necessarily very limited.

John M. Coulter.

Seeley (*sē′lĭ*), **John Robert,** an English historian born in 1834, who died in 1895, was the author of notable books, historical and religious He held a professorship at University College, London, and in 1869 was appointed professor of modern history at the University of Cambridge. His writings embrace a *Short History of Napoleon I*, *Lectures and Essays*, *Life and Times of Stein*, *The Expansion of England*, *Natural Religion* and *Ecce Homo.* This, his most celebrated book, studied the life and character of Jesus as a human being.

Seidl (*zī′dl*), **Anton H.,** an Austrian musical conductor, was born at Buda-Pest, Hungary, May 7, 1850, and died at New York, March 28, 1898. After studying at Leipsic under Richter and at Baireuth under Wagner, he became conductor of Leipsic Opera-House, and in 1882 made a tour of Europe as conductor of Neumann's Nibelungen troupe. In 1883 he was appointed conductor of the opera-house at Bremen, and two years later came to the United States, where he was received with favor in New York and other cities, as leader of German operas and as successor to Theodore Thomas in conducting the concerts of the New York Philharmonic Society. He was the notable exponent, for many years, in this country, of Wagner's music.

Seine (*sān*), one of the four chief rivers of France, rises northwest of Dijon and flows northwestward, with many windings, past Fontainebleau, Melun, Paris, St Denis, St. Germain and Rouen for 482 miles, falling into the English Channel at an inlet where stand the ports of Harfleur and Havre. It is navigable 350 miles from its mouth, or to Marcilly, and the improvement of the upper Seine as a canal is one of the schemes proposed to join Paris to the Atlantic. Its main branches are the Aube, Marne, Oise, Yonne, Loing, Essonne and Eure; and canals join it to the Somme, Scheldt, Meuse, Rhine, Sâone and Loire. Deep dredging from Rouen, through the inlet at its mouth, has made that city a seaport and has reclaimed 28,000 acres of land. The situation of Paris on the Seine has made this, like the Hudson and the Thames, one of the famous rivers of the world. See Vernon-Harcourt's *The Seine*.

Seismol'ogy. That branch of physical science which is concerned with the investigation of earthquakes,— their causes and effects, their distribution and the various circumstances attending their occurrences. Professor John Milne suggests that, in addition to what are generally known as earthquakes, seismology should investigate earth-tremors which escape attention by the smallness of their amplitude; earth-pulsations overlooked on account of the length of their period; and earth-oscillations or slow and quiet changes in the relative level of the sea and land, which geologists speak of as elevation and subsidence. But seismology is a very new science, having been developed almost wholly during the nineteenth century and being regarded as yet in the early stages of its development. Its pursuit is regarded, however, as of the utmost importance to geological and other forms of terrestrial research. It already has a great and growing body of material and literature. It is hoped that soon practical applications of the science will be developed; one of these, it is confidently predicted, will be the warning to dwellers in unstable regions when earthquakes or similar disturbances impend. Milne is sanguine that earthquake warnings will be as common and as trustworthy as the storm warnings at our seaports. The value of such warnings is beyond estimate. In Japan, where earthquakes are frequent, an earthquake-investigation committee was formed in 1892 and has been investigating the practical aspects of seismology very carefully. Professor Gerland, director of the imperial German chief station for earthquake investigation at Strassburg, now issues an annual catalogue of earthquakes, and in 1903 organized The International Seismological Association. The interest is growing in America, and the broad extent of our outlying territory gives us fine advantages in collecting data. These earth-movements are recorded by seismographs, instruments found in many modern observatories. They are, essentially, a pillar extending well into the earth to gather the vibrations, with an additional device for recording them. There is wide variation in detail of construction; but the instrument traces a continuous curve, the variations of which indicate the intensity, distance, time, and duration of the shock. Professor Milne's instrument on the Isle of Wight detects disturbances in Japan, Borneo or South America.

Seismometer (*sis-mŏm'ė-tẽr*), an instrument which is used to measure the amount and direction of displacement at any point on the earth's surface during an earthquake. The name is also applied to those devices by which the slow and gradual tilting of the earth's surface is indicated.

For the first of these two purposes the one thing essential is to place a body in neutral equilibrium and without friction. To realize these two conditions perfectly is of course impossible. But they can be very nearly approximated. Thus an open gate, with a heavy mass at its outer end, rotating about a strictly vertical axis with very minute friction, would fairly represent a seismometer. Three instruments of this kind, one free to move east-and-west, one free to move north-and-south and one free to move in a vertical direction, will give the three components of any motion produced by an earthquake; and by compounding these three motions we can obtain the original motion. In the modern instruments, as perfected by Prof. John Milne, these records are automatically photographed.

Seismometers which are employed to measure the tilting of the earth's crust generally use a beam of light which has been reflected, part of it from a mirror rigidly attached to the earth, and part of it from a surface of mercury, which remains horizontal whether the earth's crust is tilted or not. The variation in angle between these two beams measures the tilting of the earth. See Milne's *Earthquakes* in the International Scientific Series and Geo. H. Darwin's *Tides*, popular lectures before Lowell Institute, Boston, Mass., in which earth-tiltings are treated.

Selenium (*sė-lē'nĭ-ŭm*) is a very rare element which exists in two forms. In the glassy form at ordinary temperatures it is a solid of a dark-brown color and a non-conductor of electricity. When it is slowly cooled from its melted condition, it does not appear vitreous or glassy, but crystalline, of a dull leaden color, and at ordinary temperatures is a conductor of electricity. It is very sensitive to light, and its electrical resistance is much less in the light than in the dark. This property led to the discovery of the photophone in 1880. Selenium is found chiefly in combination with lead, silver, copper or iron; but it has also been found in sulphur and certain iron sulphides. Selenium was discovered in 1817 by Berzelius in the waste of a sulphuric-acid factory.

Selective Immigration Act. From the time the United States became an independent nation until 1914, nearly 33,000,000 immigrants found homes in this nation. Just before the World War, immigrants were landing at the rate of nearly a million and quarter yearly. There were very few restrictions to immigration except the Chinese Exclusion Act of 1882, and the "gentlemen's agreement" between Japan and the United States made by President Roosevelt in 1907. From 1914 to 1918 the World War prevented immigration, but with the close of the war immigration again became a problem.

At the close of the nineteenth century immigration conditions were becoming somewhat alarming. Before then, immigrants scattered themselves throughout the country, and adopted American living conditions and thoughts. By 1900, however, the newcomers settled thickly in cities, and the racial prejudices of the Old World fomented in this country. As a rule, too, those coming by the millions were not as desirable as citizens, as those who had formerly come to these shores. The European nations adopted immigration policies of their own, which sent to this country the less desirable peoples. Of course there were many exceptions, but the general condition prevailed. Many newcomers, also, did not expect to make this country their native land. Finally, the very great numbers entering and settling in groups, acted as a menace to national unity.

Law of 1917. To prevent the exodus of so many from Europe to the United States, the National Congress passed a law in 1917 whereby for the next five years the number from each country permitted to enter the United States was three per cent of the number residing in this country according to the census of 1910. This law was extended to operate until June 30, 1924.

Law of 1924. In May, 1924, the Johnson Bill was passed which excluded from the United States all those who could not become citizens of this country. Thus all Oriental nations were excluded, with the exception of a few specified classes. For all other nationalities and races the bill provided two sets of conditions. The first set was arranged to operate from June 30, 1924, until June 30, 1927. It provided that the number admitted from each country should be two per cent of those from the same country based upon the census of 1890. The second set of provisions to operate after July 1, 1927, limited the total number of immigrants to 150,000, the quota from each country to be determined from the census of 1920. These quotas were to be based on "national origins," that is, the annual quota of any nationality was to be such a number as would bear the same ratio to 150,000, as the number of inhabitants in continental United States in the year 1920, having that origin.

"The National Origins System" was put into operation on July 1, 1929, and the 1924 Quota was discarded. In September, 1930, President Hoover, exercising the authority delegated to him by the Immigration Law, issued an order through the State Department to American Consuls abroad, requesting them to restrict immigration as much as possible in an effort to allay an increased unemployment problem in the United States.

The total number of immigrant aliens admitted to this country during the fiscal year 1932 was only 23,068, although the quota provisions of the Immigration Law permit the entrance of 150,000. In that same fiscal year there were 80,081 emigrant aliens who left the United States for permanent residence abroad. Under the National Origins System the quota for Great Britain and Northern Ireland is 65,721; for Germany, 25,957; for the Irish Free State, 17,853. No quota restrictions exist for Canada, Newfoundland, Panama Canal Zone or the independent countries of Central or South America.

Included as "quota" immigrants under the existing law are those to whom preference shall be given. Chief of these is the class of kinsfolk, unmarried children under twenty-one years of age, fathers, mothers, husbands or wives of citizens of the United States who are twenty-one years of age or over. The second class includes skilled agriculturists with their wives, and dependent children under sixteen years of age, either accompanying them or following to join them.

"Non quota" immigrants include children under eighteen years of age and unmarried, wives or husbands of citizens of the United States by marriage prior to June 1, 1928; immigrants previously admitted to the United States and returning from temporary visits abroad, and immigrants born in Canada, Newfoundland, Mexico, Cuba, Haiti, the Dominican Republic, the Canal Zone, or any independent country of Central or South America, with their wives and unmarried children under eighteen years of age, accompanying or following to join them. "Non quota" immigrants are also those who have been for the two years immediately preceding application, and who wish to come to the United States solely for the purpose of carrying on the vocation of minister, or professor of a college, academy, seminary or university, and his wife and unmarried children under eighteen years of age; a bona fide student at least fifteen years of age who intends to study at an accredited school, and a woman who was a citizen of the United States and who previously to September 22, 1922, lost her citizenship by marriage to an alien, but who at the time of her application is unmarried.

By means of these careful distinctions, immigration can be guarded through giving preference to the foregoing classes of "quota" immigrants, and allowing desirable foreigners to enter as "non-quota" immigrants. The immigration laws are thus chiefly restrictive of undesirable and harmful aliens. The United States Immigration Law forbids the entrance of certain aliens into the country, as for instance, idiots, imbeciles, feeble-minded, epileptics, insane persons, addicts of chronic alcoholism, paupers, professional beggars, vagrants, polygamists, and victims of tuberculosis in any form or those afflicted with any loathsome or contagious disease.